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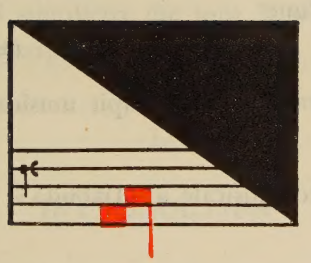

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CONTENTS

The « Timaeus » Scale
Jacques Handschin 3

Gothic Form — A Marginal Note
Otto Gombosi 43

The Mixture Principle in the Mediaeval Organ — An Early Evidence
H. Avenary-Loewenstein 51

Dowland's Lachrymae Tune
Otto Heinrich Mies 59

L'Etablissement d'un catalogue par incipit musicaux
Nanie Bridgman 65

Da « Dabudà » strumento musicale a « Dabudà » Millentatore
Mario Ferrara 69

A Fourteenth-Century Florentine Treatise in the Vernacular
Armen Carapetyan 81

Announcements 93

THE « TIMAEUS » SCALE

JACQUES HANDSCHIN

REFERENCES: A. Boeckh, *Kleine Schriften* III, 1866, 158 ff., in a paper « Ueber die Bildung der Weltseele im Timaeos des Platon », first published in 1807.

A. J. H. Vincent in *Notices et extraits des manuscrits de la Bibliothèque du Roi et autres biblothèques,* XVI, 2, 1847, 176 ff., « Sur le diagramme musical de Platon ».

A. von Thimus, *Die harmonikale Symbolik des Altertums,* 1868, I 156 ff. and II 210 ff.

J. Stenzel, *Zahl und Gestalt bei Plato und Aristoteles,* 1924 (references are made to the second edition, 1933).

A. E. Taylor, *A Commentary on Plato's Timaeus,* 1928, 136 ff.

J. Handschin, *Der Toncharakter,* 1948, 360 ff.

NOTE: For the sake of simplicity the tone B natural is indicated by *h,* B flat by *b,* F sharp by *fis* and E flat by *es.*

I.

INTRODUCTION

Timaeus is one of the latest dialogues by Plato (429-347 B. C.). I think the figure of Plato, as reflected by this dialogue, does not exactly correspond to that which is current. One is accustomed to look upon him as a thinker whose idealism takes a hostile view of the world of phenomena, despising beauty as perceived by the senses. But this touch of pathetic pessimism is absent in Plato's last dialogues. His attitude here may be described as one of contemplative objectivity which leads, as it necessarily must, to the conception of a world order established by a Divine power. In fact, this order is revealed by so many perceptible signs that, even where to us it seems as disorder, we must assume that it is order in a higher sense, not yet disclosed to us; also Plato in *Timaeus,* 56 C, 68 B-D, 87 C, is confident that planning and order,

symbolized by numerical ratios, must exist even where we are not able to verify them. This conviction has always been the property of thinkers representing the so-called « objective idealism », as for example, Johannes Erigena and Leibniz; but it is found — as it can not be otherwise — also with thinkers to whom we should not especially ascribe that variety of thought, because the problem of correlation of the Objective and the Subjective is of first importance in thinking and it can not be answered without assigning a rôle to a mind transcending ours.

I think it was the merit of J. Stenzel to have done justice to that stage of evolution in Plato's thought presented by his last dialogues (and by his famous lecture about the Good, which is unfortunately lost). Starting from the Socratic idea of moral freedom of the individual, which establishes its law by himself (yet in conformity with a superior and therefore objective idea), Plato first sought the « Good » in the human soul and believed that demonstrating the Idea to man would suffice to induce him to realize it. Hereupon (in his *Republic*) he turned to the problem of human community, at first believing that also in this case the cognition of the Idea (represented by the Constitution) would suffice for the realization of the Good, afterwards recognizing that a constitution is relative in value and that a ruler would be required who by his insight could be qualified to alter the law. At last (in *Timaeus* itself) Plato advanced to the idea of a world ruled by a Divine creator, he being the prototype of the ruler of the state. In this process of evolution Plato more and more returned to archaic currents of Greek thinking, going back even to the thought of Old Orient; and in doing so he at the same time anticipated Hellenistic syncretism (Stenzel p. 111 f.).

As we may add, Plato's idea of worldly rule as a reflexion of heavenly rule has in a way survived in Byzantium and even until 1917 in Russia in connection with Christian doctrine, and in China until 1912, of course without any association with Christian doctrine. The assumption that earthly power must be derived from a transcendental realm is really present already in Plato's *Republic* where it is reflected in the idea of the king-philosopher and the philosopher-king. There exists, further, a parallel between the abnegation, inherent in the situation of the « just » who are to govern the state, according to *Republic*, and the Byzantine idea that the monarch must prostrate himself before Christ. In the same dialogue Plato is not at all sure that the just ruler will always be understood and hailed by the members of the community and, as is known, he has even the prophetic vision of the just who, after having suffered many pains, will be crucified.

Viewed from our side Plato is, of course, a thinker of restorative

character. What he tries to overcome and to surpass is the idea of humanism, taking this word in its narrow sense of « deifying humanity » or, as Protagoras said, making the man « the measure of all goods ». This idea was in a way present also in Socrates, yet connected with the idea of a subjectively perceived higher Good; in so far Plato, in his early dialogues, opposed Socrates to the sophists. But afterwards he transcended the Socratic point of view; he noted even with some pleasure the strict regulation, in Egypt, to which human affairs were submitted on a religious basis – and among these affairs was music.

What matters in the present connection is that, in accordance with the conceptions of late Plato, mathematics and music necessarily assume – or they reassume – a great importance in philosophical thought: *number* being by itself symbol of order and *sound* connecting in an unique way the outer world with the inner, the physical with the perceptual, the rational with the sensuous. It is indeed a peculiarity of the perception of sound that those sound relations appear most natural, obvious or fundamental, that correspond to the simplest arithmetical ratios (and relations between sounds determine the character of the single sound as perceived by us). Of course this correspondence between the character of sound relations and the form of numerical ratios is independent of the fact whether we do or do not know those ratios; as Ptolemy said (*Harmonics* I 10): our perception is just « crying out », when it meets with the consonance of the fifth as soon as the ratio 3:2 is realized on the monochord.

It is therefore logical that mathematical demonstrations and musical exemplifications are found especially in the later works of Plato; and, we may add, it is also logical that J. Stenzel, the historian who devoted to this phase of Plato's thought a special attention, dealt so much with the mathematical conceptions of Plato; it is true he did not concern himself with Plato's ideas about music, but both fields are closely connected in themselves. It is clear that an investigation of these mathematical and musical passages in Plato is as important in understanding him, as for the history of mathematics and music. But these passages still present many obscure points. In this paper we deal with that passage in *Timaeus* (35 A ff.) where a scale, musical as well as cosmical, is expounded.

We must note that even before Stenzel L. Robin had thrown much light upon this side of Plato's thinking. I have in mind his dissertation *La théorie platonicienne des idées et des nombres d'après Aristote* (1908) and that excellent chapter devoted to late Plato in *La pensée grecque et les origines de l'esprit scientifique,* (1923).

II.

THE BUILDING OF THE WORLD SOUL; STAGE 1. AND 2.

As he often does, Plato unfolds his thought through a fable. He tells us that God the Creator made the World Soul by taking the Indivisible substance or the Same, and the Divisible or the Other and mixing them into a Third substance.

What may be meant by those two primary substances is not so easy to determine. Perhaps Plato blends the two main currents of pre-Platonic thought: that of the Eleatics who saw everywhere one unchangeable and immovable essence, and that of Heraclitus who saw nothing but motion and change. Probably there is also a connection with the Pythagorean opposition of « limit » and « unlimited », of which the mixture yielded the « limited ». We must also remember the opposition of the « One » to the « unlimited Two » which occurs in Plato elsewhere (see below, p. 15 f.). I invite the reader to consult the learned survey contained in Taylor's commentary, p. 109-136, to see how those notions have been interpreted and how they may be interpreted. I shall only note here that there exist also musical analogies. Thus there are commentators who have assumed that Plato meant by the Same the number 1 and by the Other the number 2, both yielding the relation 2:1 = octave = the harmony « par excellence ». Plutarch in his commentary on *Timaeus* (Ch. 27) also gives to that opposition a musical turn: he identifies the Same or One with the tone and the Other or Divisible with the interval, according to which the third essence would be the melody. This is not only a beautiful variation to the theme proposed by Plato, but represents at the same time a reconciliation of the two opposed tendencies in ancient musical psychology, namely, the Platonic and Pythagorean which hold the tone in first place, and the Aristoxenian which gives the prominence to the interval. From the point of view of musical psychology we could further propose to parallel the One and the Same with the octave and the Other with the twelfth or fifth, in so far as in our tonal system (and, in reality, in every system) the octave means repetition of the same tone quality, whereas the twelfth or fifth is the basis of tone variety, since all the different tone qualities result from the different degrees in which this interval is juxtaposed — in other words, from the « cycle of fifths ».

The question, then, is to build the World Soul or the principle of the whole. Having mixed the two primary principles into a third, the Creator again mixed these three into one essence; and then the latter was subjected to mathematical organization. He first took one part of the whole. then the double of this part, then one and a half of the second, or the triple of the first, then the double of the second, the triple of the third, the octuple of the first, and 27 times the first. Thus

the seven parts were to each other in these ratios: 1 2 3 4 9 8 27; as a matter of course, these numbers are taken to represent musical tones, or more exactly, the ratios between numbers are taken as tone intervals.

As we see, these numbers stand for the first three powers of two (2, 4 and 8) and for those of three (3, 9 and 27), 2 and 3 being the first of even and odd numbers respectively. The reason why Plato goes as far as the third power and not farther is, as it has been assumed, that the third power and the third dimension represent the limit of corporal things or, as a commentator has said, the soul must proceed into bodies (we shall return to that question below, p. 31). Stenzel explains that « musical harmony » does not need more than three powers (p. 103), but we shall see that it really needs more. Yet in fact already Plato's seven numbers include *four* powers of 2 and 3 respectively, as 1 is equal to 2^0 and to 3^0; whether or not Plato himself may have been conscious of this fact, it is important for the musical interpretation of the scale.

As has already been indicated, in constituting our tone system (and, in reality, every tone system) we must distinguish between the octave (ratio 2:1) and the twelfth or fifth (ratios 3: 1 and 3: 2) in this sense that the latter and not the former is the constitutive interval, since the fifth produces by juxtaposition or multiplication all kinds of tone qualities, whereas the octave is in this respect meaningless, producing always the same quality in different position or « site ». Yet we must not proceed too hurriedly: as we see, our series means juxtaposition of thrice the octave and thrice the twelfth, but whether the juxtaposition is by ascending or descending we do not yet know.

We shall note that our series includes intervals yet other than the octave and the twelfth: consecutive tones (or numbers) yield the fifth 3:2, the fourth 4:3 and the whole tone 9:8. We can also establish the existence of intervals composed of those noted, 8:3 being, e. g., composed of an octave and a fourth. But we must now turn to something which would be more like a scale, i. e., a series composed of « neighbouring » tones.

Plato achieves the first step in this direction by stating that the Creator filled up the « double » and the « triple » intervals, i. e., the octaves and the twelfth by two « means ». He does not say expressly which means, but there can be no doubt that we have to interpose within either of these ratios or intervals the *arithmetical* and the *harmonical* mean; none of Plato's commentators has understood it otherwise.

As is known, the arithmetical mean is that which is equidistant form both outer terms (or, taken quantitatively, it is half their sum), whereas the harmonical mean must conform to the condition that the first outer term be to the second, as the difference between the first and the mean is to the difference between the mean and the second (which is the case, e. g., in the series 6: 4: 3).

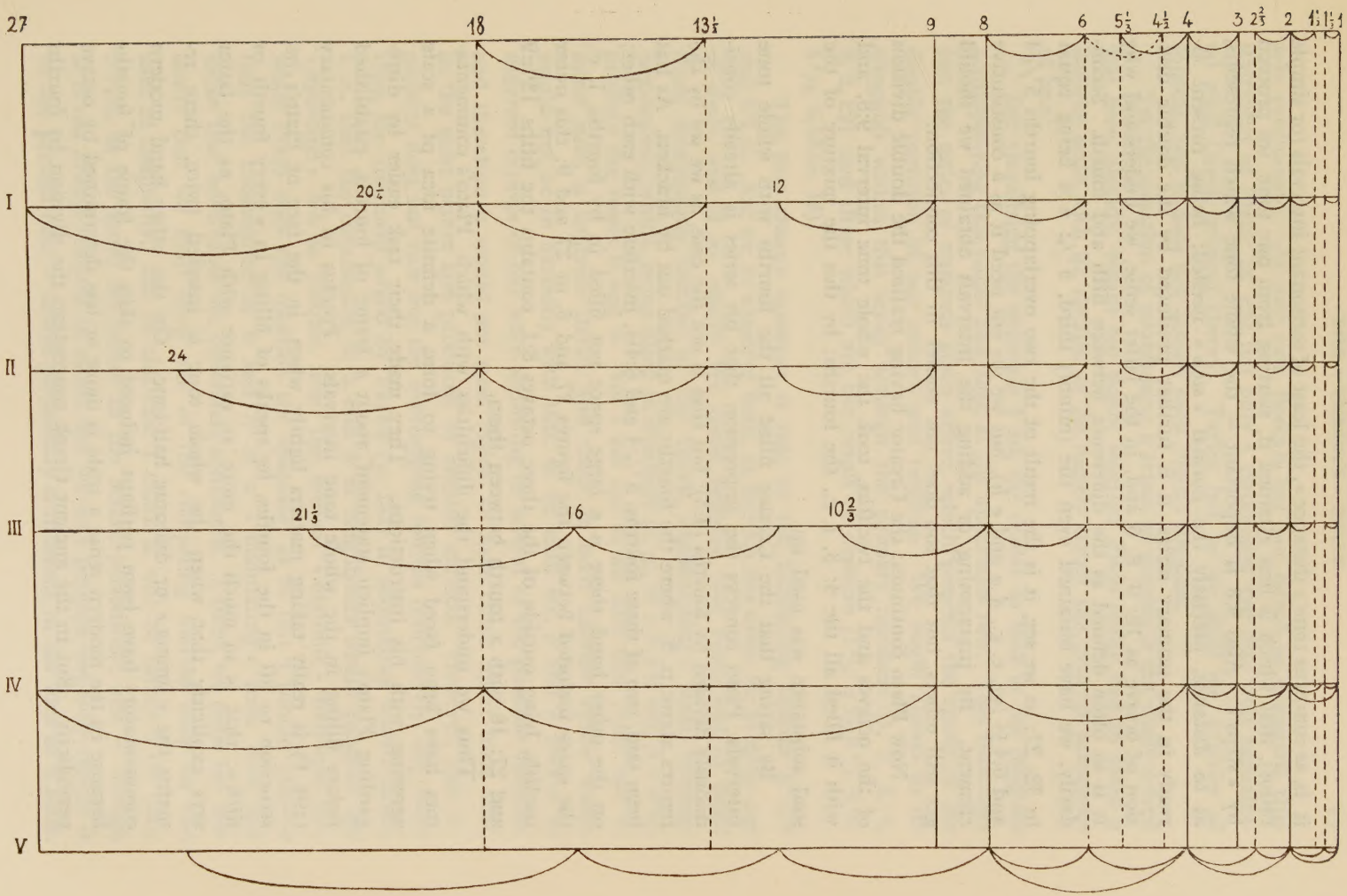
By dividing octaves and twelfths in these two ways, we obtain within the octave two tones distant from the outer tones respectively by a fourth (12: 9: 8: 6, the famous composite of four numbers which combines in itself the series' 4: 3: 2 and 6: 4: 3), and within the twelfth two tones distant from each outward tone by a fifth (6: 4: 3: 2, this being a combination of 3: 2: 1 and 6: 3: 2). As we see, both double divisions are symmetrical as to tone distance (or as to the magnitude of the ratios): in either case the smaller interval is in the middle (whole tone and fourth respectively) and the larger interval at both sides (fourth and fifth respectively).

In applying this double division to every one of the octaves and the twelfths present in the primary series, we obtain:

1 1 1/3 1 ½ *2* 2 2/3 *3* *4* 4½ 5 1/3 *6* *8* *9* 13 ½ 18 *27*

(the numbers of the primary series are written in italics). Of course some of the numbers have been obtained in different ways, as, e. g., 1½ which is the arithmetical mean of 2 and 1 and the harmonic of 3 and 1. We could easily do away with fractions by multiplying the whole series with 6. Musically speaking the main feature of our series, although not expressed by Plato, is the fact that it includes *five* different powers of 3 (which holds good whether we may multiply it with 6 or not), that is, five different degrees of the series of twelfths or fifths, or five different tone qualities (characters), as 27 and 13½ correspond to 3^3, 9 and 18 and 4 ½ to 3^2, 3 and 6 to 3^1, 1 and 2 and 4 and 8 to 3^0, 1 1/3 and 2 2/3 and 5 1/3 to 3^{-1}. Here we may remember that five tone qualities, built up on this basis, constitute the pentatonic musical series (e. g. *c d e g a*).

As we have noted, already the primary series contained the fifth, the fourth and the whole tone, besides the octave and the twelfth; and the double division applied to the octave and the twelfth produces further such intervals. Among these it is especially the fourth whose rôle is constitutive in the building of a scale, and that for the simple reason that


27
18
13½
9
8
6
5⅓
4⅓
4
3
2⅔
2
1⅗
1⅓
1
I
20⅔
12
II
24
III
21⅓
16
10⅔
IV
V

it is, as concerns tone « distance », the least of consonant intervals (or simple ratios), that which is first attained if, starting from one tone. we proceed by « steps ». Also 9:8 is important — the whole tone which represents, as to distance, precisely the normal « step » needed; being present already in the primary series, it is further produced by the double division of octave as 12: 9: 8: 6 and, in the latter sense, we understand why it is so often defined as the difference between fifth and fourth. Secondarily, we have obtained even the (minor) third, $5\,{}^{1}/_{3}$: $4\,½$ being equal to 32: 27; as we see, it is the result of the two overlapping fourths $5\,{}^{1}/_{3}$:4 and 6:4 ½ (or, e. g., *d a* and *e h*), but we do not need it as a constitutive element. By juxtaposing or adding the intervals obtained we should get still others, but that too does not matter in this connection.

Now Plato continues: the Creator having realized the double division of the octaves and the twelfths, took the whole tone interval 9:8, and with it filled all the 4: 3, i. e., the fourths; by this the mixture of the soul substance was used up.

By saying that the Creator filled all the fourths with whole tone intervals, Plato conveys the impression that his series is already continuously divided by fourths (4:3); but that is not the case, as we see by the figures above p. 8, where the fourths are marked out by brackets. As has been said, two of these fourths, $5\,{}^{1}/_{3}$:4 and 6:4½, interfere with each other; on the other hand there is a large space not filled in by fourths, i. e., the space included between the figures 27 and 8, or 27 and 9; this outer twelfth, lying outside of the three octaves 8:1, contains the fifths $13{}^{1}/_{2}$:9 and 27: 18 with a fourth between them.

Thus we understand the difficulties with which Plato's commentators have been faced when trying to form a definite idea of a scale agreeing with his instructions. They made their task easier by disregarding Plato's implicit statement about a frame of fourths, established *before* filling in the whole tone intervals. Proclus in his commentary (194 F) is really taking matters lightly when, in the face of Plato's instruction to fill in the fourths, he speaks of filling in « every fourth *or fifth* »; that is so much the more at variance with Plato, as the latter says explicitly that when the whole tone is inserted twice, there remains the « limma » or diatonic half-tone. On the other hand modern commentators have been perhaps induced to skip the frame of fourths because in the modern sense a scale is more or less determined by octave periodicity. But in the ancient Greek conception the division by fourths

was preeminent. At any rate Boeckh has not dared to disregard that statement of Plato; he was not only a philologist but also well acquainted with Greek musical theory. Taylor has, as we shall see, a series of fourths, but it does not accord with Plato's division.

Yet the question of establishing a frame of fourths is not easily solved and here, already, begins our doubt whether Plato really had in mind a definite scale with its details, or he merely stated the general principles of one.

For vizualizing the situation I ask the reader to look at the diagram accompanying this paper and, first, at the uppermost row. This illustrates just the series of numbers given above, which presents the result of the double partition of our octaves and twelfths. We ought always to distinguish within this series between the primary numbers (1, 2, 3, 4, 8, 9, 27) and those which are the result of division (1 $^{7}/_{8}$, 1 ½, 2 $^{2}/_{3}$, 4 ½, 5 $^{1}/_{8}$, 6,13 ½, 18).

The first thorny question is that of the interfering fourths 5 $^{1}/_{8}$:4 and 6:4 ½. Are we to conserve both, as Boeckh has done, or to drop one of them, and if so, which? We could imagine that Plato had in mind those overlapping fourths of the Greek « modulating » scale (systema metabolon), which, being filled in similarly (e. g., as *a b c d* and *h c d e*), produce the tones *b* and *h*. Yet I am not at all sure that Plato had in mind such a concrete detail and there is even another detail which would not be in harmony with this: as we shall see, *b* and *h* coexist in *different* octaves of our scale according to several of the possible variants, and therefore it would not seem logical to have them, apart from that, in the same octave and produced by another method. However, that argument does not rule out the overlapping fourths conclusively, any more than the argument urged by Taylor (p. 142) in accordance with Proclus, i. e., that the coexistence of *b* and *h* as neighbours would produce the « apotome » *b-h* as distinct from the normal « diatonic » half-tone *a-b*, while Plato does not mention the apotome; as to this I should observe that the coexistence of *b* and *h* in a « modulating » scale does not mean that both tones are concretely connected. I think we must say modestly that we shall drop one of the competing fourths only for the sake of simplicity; and in this case I think it will be rather 6:4½ than 5 $^{1}/_{8}$:4, as the latter fits better in the octave periodicity; and — though it is not always realized in music and we may perhaps not fully realize it in the present case — octave periodicity is inherent in the idea of a scale.

In consequence the tone 4 ½ will have lost its position as a point of support in the framework.

In fact at this point I am already hesitating whether I ought to continue. But with the good intention of arriving at an illustration, at least, of what Plato may have meant, I go on and now it is the question of having fourths everywhere. Again I ask the reader to look at our diagram, and this time at rows I, II and III where some of the possibilities are outlined.

I). The disposition most closely adapted to that of the uppermost row would be I. In fact here all the tones of the uppermost row (excepted 4 ½) preserve their rank as points of support, that is to say they are defining intervals of fourths. Yet 20 ¼ and 12 are added to the Platonic tones. In this case beginning from 6, there would always be fourths separated by a whole tone; this means that we should obtain within this space fifth periodicity, replacing octave periodicity. Or, to put it more precisely, octave periodicity would be ruled out from 8 onwards, as in the « normal » way the next fourth after 8:6 would have to be $10\,^{2}/_{3}$:8. In consequence the octave repetitions of $5\,^{1}/_{3}$, i. e., the tones $10\,^{2}/_{3}$ and $21\,^{1}/_{3}$, are lacking; or to put it still otherwise, the fourth 12:9 appears as an octave repetition of $5\,^{1}/_{3}$:4 shifted by a whole tone; 18:13 ½ is in the same position when compared to 8:6; 27:20 ¼ is shifted by one whole tone in relation to 12:9 and, therefore, by two whole tones in relation to $5\,^{1}/_{3}$: 4. From the musical point of view, looking at the tone qualities or the powers of 3 present, we see there are not less than *six*, which is precisely a consequence of the fact that octave repetition is so largely disregarded: the tones 1, 2, 4 and 8 mean 3^{0}; $1\,^{1}/_{3}$, $2\,^{2}/_{3}$ and $5\,^{1}/_{3}$ mean 3^{-1}; 1 ½, 3, 6 and 12 mean 3^{1}; 9 and 18 mean 3^{2}; 13 ½ and 27 mean 3^{3}; 20 ¼ means 3^{4}. Here we may note that the sixth power of 3, 729, assumes a special importance with Plato in another connection (*Republic* 587 D), where he takes it to represent the ideal period of solar revolution (729 days and nights = 364 ½ whole days instead of ca. $365\,^{1}/_{3}$, a magnitude already known at that epoch); but of course I should not take this as a « proof » that we must follow this method, because, I think, there is nothing to be proved here.

II). Here the fourth 12:9 is, as in case I, shifted by a whole tone in relation to the octave repetition of $5\,^{1}/_{3}$:4, but the shifting goes no farther, as the fourth 24:18 is contiguous to 18:13½ and therefore an octave repetition to 12:9. In fact the only difference between I and II is that in the latter

the first tetrachord from left is joined to the second, instead of being separated from it by a whole tone. The effect of this is, precisely, that octave periodicity is less violated than in case I. In our case, again, two tones are added which were not in the uppermost row, 12 and 24, but as they are in octave relation, they may appear as substantially one tone. One of the tones of the primary series, 27, has been left outside the « skeleton ». The last note being 24, the tonal range of the series is 4 octaves and a fifth instead of 4 octaves and a major sixth; in this connection we may remember that sometimes 24 and 1 are given as limits of cosmic harmony (Macrobius II 1, cf. Aristotle *Metaphysics* XIII 6). Perhaps the fact that this disposition does not fill out the whole range of 27:1 seemed tolerable because in the typical two octave-scale of the Greeks there was a note, the Proslambanomenos or « added », which was considered to be in a way outside the structure by a whole tone. This series gives *five* different powers of 3, since 1, 2, 4 and 8 mean 3^0, $1\frac{1}{3}$, $2\frac{2}{3}$ and $5\frac{1}{3}$ mean 3^{-1}, $1\frac{1}{2}$, 3, 6 and 12 mean 3^1, 9 and 18 mean 3^2, and $13\frac{1}{2}$ means 3^3. Thus the number of tone qualities is the same as in the Platonic series (uppermost row) and even the tones are the same (apart from different octave localisation, as the tone quality denoted by 3^1 has two more representatives, 12 and 24, and the 3^3 quality one less, 27).

III). In dealing yet more freely with the terms of the uppermost row we can concede to the « law » of octave periodicity its full sway. In this case we continue after 8 exactly the same kind of division which goes on within the three octaves 2:1, 4:2 and 8:4. That would mean interpolating first 16 which gives the next octave, then, between 8 and 16, the numbers $10\frac{2}{3}$ and 12, and beyond 16 the number $21\frac{1}{3}$. In this case the uniform division of the octave would extend to $21\frac{1}{3}$, i. e., to 4 octaves and a fourth; the extreme tone of the primary series, 27, would remain outside, as it is separated by two whole tones from $21\frac{1}{3}$. The disadvantage of this arrangement is that no less than four tones, $10\frac{2}{3}$, 12, 16 and $21\frac{1}{3}$, would be added to the Platonic series in the uppermost row. Two among the tones of the primary series, 9 and 27, would be dropped, as well as two further tones contained in the uppermost row, $13\frac{1}{2}$ and 18, and the fourth $18:13\frac{1}{2}$ would not be preserved. From the musical point of view, looking at the tone qualities, there would be only *three*, as 3^0, 3^{-1} and 3^1 occur in the different octaves, 3^0 being

represented by 1, 2, 4, 8 and 16, 3^{-1} by $1\,^1/_3$, $2\,^2/_3$, $5\,^1/_3$, $10\,^2/_3$ and $21\,^1/_3$, $3\,^1$ by 3, 6 and 12.

Now I think it is useless and hopeless to determine which of the three methods Plato has had in mind. Leaving a gap that can be filled in different ways is just characteristic of his attitude: he puts down a principle and does not much care how it will be carried through. Plato even fails to give prominence to the difference between 2 and 3 which is musically essential, for the octave, corresponding to 2, serves only for delimiting spaces in the scale, whereas the twelfth or its octave equivalent, the fifth, corresponding to 3, produces different and ever more different tone qualities. Nor does Plato notice that these two constitutive principles of scale construction are in some way antagonistic or, at least, irreductible, as never will a power of 2 coincide with one of 3 and therefore never will a tone resulting from octave juxtaposition exactly coincide with one resulting from the juxtaposition of fifths (hence the « Pythagorean comma ») — although, of course, in practical perception a tone will always be able to take over the value of another one so near to it as to be scarcely distinguishable.

III.

THIRD STAGE

But the fable continues. Whichever we may choose of the variants I, II or III, we have not as yet a scale. As we have intimated, Plato goes on to tell us that the Creator filled all the fourths (the 4:3 intervals) with the whole tone (9:8), every fourth containing two of these and a rest interval, equal to 256:243 or 2^8:3^5.

Now for a survey we ought to fill out all the fourths in row I, II and III. But as that would take much time, we can restrict ourselves in every case to the first and the last fourth.

I). The fourth $1:1\,^1/_3$ will become $1:\,^9/_8:\,^{81}/_{64}:\,^4/_3$ and the fourth $20\,¼:27$ will become $^{81}/_4:\,^{729}/_{32}:\,^{6561}/_{128}:$ 27. That is precisely the « diatonic » form of the fourth or the diatonic « tetrachord », if we take the word « diatonic » to mean the combined use of whole and half tones, a half-tone being interposed after every two or three whole tones. It is true we might doubt whether 9:8 has to be apposed to the smallest number, as we have just done, or to the greatest which would produce, respectively,

$^{4}/_{3}$: $^{32}/_{27}$: $^{256}/_{243}$: 1 and 27: 24: $^{64}/_{3}$: $^{81}/_{4}$. But that does not matter because, as we shall see, we are faced with two reciprocal methods of computing, one of which takes numbers as frequencies (vibration numbers) while the other takes them as string lengths; and in this aspect 1: $^{9}/_{8}$: $^{81}/_{64}$: $^{4}/_{3}$ will yield the same result on the basis of string lengths as $^{4}/_{3}$: $^{32}/_{27}$: $^{256}/_{243}$: 1 on the basis of frequencies, and vice-versa. In fact the wording of Plato does not even exclude a third possibility which would locate one whole tone beside the one limit of the fourth and another beside the other limit, thus putting the half-tone in the middle; again we see that Plato does not enter into concrete details. It is clear that having filled out all the fourths we obtain a greater variety of fraction numbers than before; and this we can again rule out by multiplication.

II). In this case the first tetrachord would be as in case I, and the last 18: $^{81}/_{4}$: $^{729}/_{32}$: 24.

III). In this case the first tetrachord will be again as in case I, and the last 16: 18: $^{81}/_{4}$: $^{64}/_{3}$.

But now we are faced with the question which is practically foremost. Before being able to represent our numbers by sound-names we must determine whether they are to mean relative frequencies or relative string lengths. As is known, these two are in reverse proportion one with another. All commentators, from Boeckh onwards, but with the exception of Thimus, have decided in favour of lengths, taking this as a matter of course. But it is not a matter of course, as, e. g., Plutarch, who was a very good Platonist, supposes frequency numbers in his commentary (Ch. 18) and Plato himself in *Timaeus* 67 B ascribes to the low tone the lesser rapidity and consequently the smaller number. (It is true Plato speaks of rapidity of locomotion, not rapidity of vibration, cf. *Der Toncharakter* p. 136 and 139-141; that may be an error or a kind of illustrative speaking; in either case the question is of « quantity of movement »).

Again I think that it is rather in the style of Plato to let the question open: what did matter for him was the correspondence between tones and numbers, or tone relations and numerical relations; and, whether the reader would choose one or the other among those reverse proportionals, was to him a secondary question. Nor can we take him literally with regard to the compass of his scale, because 4 octaves plus a major sixth is a compass unheard of in Greek musical theory. As to reciprocity of numbers, we may yet remember the notion of the « unlimited

Two », mentioned above as occurring in Plato, and which, according to Stenzel (34, 51 f. and. 59 f.), would signify the Two as a principle independent of whether it is taken as multiplier or divider, or, in other words, as positive or negative power; indeed, in this case it would be the « undefined Two » rather than the « unlimited », but with the Greek word both meanings are compatible. We have to remember also what Plato (*Republic* 525 D f.) says about fractional numbers: instead of fractioning the One, mathematicians would rather multiply it, or in other words, instead of saying, e. g., $^3/_5$, they rather say that a definite magnitude, taken five times, will be equal to three units. In all this there is a tendency to lay stress more on the formal than on the material character of number, to take number as a principle rather than as the measure of concrete quantity. (As is known, the idea of continuous quantity has found its extreme representation with differential calculus created by Leibniz; and yet it was this great thinker himself who, in regard to musical tones, most decidedly insisted upon the importance of integer numbers and, especially, the first prime numbers).

Yet as modern people we crave for concretization and, in this case, we have to choose. We choose — for the time being and with all necessary reserve — string lengths, in order to be more in accordance with the majority of modern commentators; and we follow them also in their method of inserting the whole tone, that is to say, we juxtapose two whole tones by starting from the smaller number which is, according to our first assumption, the higher tone of the fourth; in consequence the rest interval (the half-tone) will be placed at the lower end, producing the « Dorian » species of diatonic tetrachord (different from the « Lydian » which has the half-tone at the higher end and the « Phrygian » which has it in the middle — it is true, these names as applied to *tetrachords* are not quite authentic).

Now at last we can associate with numbers our favourite tone letters. But here we must yet remember that we should take them not, as is usual, as absolute degrees of pitch measured by vibration frequencies per second, but as a system of relative pitches or tone relations which, by principle, can be based on any concrete pitch. In reality even our tone letters had originally this meaning in the « Gregorian » system, and only by the development of instrumental music and ensemble playing was the relative (the musically real) meaning of the tone letters superseded by the concrete (the musically abstract).

Therefore if we take on the monochord the whole string length as representing 27 and its twenty seventh part as representing the number 1 — which gives an interval of 4 octaves and a major sixth —, the question whether we shall denote these two tones as G_1 and e''', or C_1 and a'', or F_1 and d''', or D_1 and h'', etc., may cause some hesitation. We must answer that we are not interested in the concrete pitch of the tone taken as starting point, and that therefore we do not use the letters in the modern fixed sense. But taking them in the old, relative sense, would there be a reason for prefering one denomination to the other? Of course, a reason there exists, and the criterion which must determine our choice is the same as that observed in the old « Gregorian » system. In terms of « musical theory », it may be stated thus: « avoid accidentals as much as possible » or, in terms of musical psychology: « ascertain the tone qualities involved (i. e., the degrees of the series of fifths) and dispose them with *d* as centre » — so that a series of five tones will take the form, *c g d a e*, a series of seven tones the form, *f c g d a e h*, a series of nine the form, *b f c g d a e h fis* (supposing in the latter case that *b* and *fis* are real qualities coexisting with the others, not mere « chromatic » extensions or « modulating » features). It is true, this supposes an odd number of tone qualities, for in the case of an even number the centre would fall between two qualities, say between *d* and *g*, or *d* and *a*; but actually systems with an odd number of terms have always been predominant and we can even doubt whether others (hexatonic, octatonic) have existed in the full sense.

Now Boeckh has taken the highest tone, the one corresponding to $^1/_{27}$ of the length, to be Nete diezeugmenon, which is *e'* in our transcription; that would mean that the tone corresponding to the whole string is G_3, a tone located more than two octaves below the lowest tone of our piano. In order to avoid such extreme depths we should shift this series by three octaves, replacing G_3 and *e'* by *G* and *e''''*.

We shall now see what kind of scale our three rows will produce on these premises. I hope the reader will forbear with me if this time I invert the order for the sake of convenience.

III). The third disposition would produce this scale:

G 27 *A H c d e f g a h c' d'* 9 *e'* 8 *f' g' a' h' c'' d'' e''* 4 *f'' g'' a''* 3

h'' c''' d''' e''' 2 *f''' g''' a''' h''' c'''' d'''' e''''* 1.

There are 34 tones. As we see, the letters adopted agree with the criterion stated above. In order to survey the situation more easily, we must always look at the tone qualities (or the powers of 3) involved. It is clear that the number of qualities as contained in the frame of fourths (according to row III of our scheme) is augmented by the filling out of the fourths, as the tones inserted in them are themselves degrees of the series of fifths (or powers of 3), $^{9}/_{8}$ being 3^{2} divided by 2^{3}, and $^{81}/_{64}$ being 3^{4} divided by 2^{6}. Indeed, Plato does not make that evident, for in his sense $^{9}/_{8}$ is taken from the primary series 1 2 3 4 8 9 27, where it stands as the difference between the octave 4:8 and the none 4:9 (or we could extract it from the group 6: 8: 9: 12 resulting from the double division of the octave, where it represents the difference between the fourth 6:8 and the fifth 6:9); and the tone $^{81}/_{64}$ is, in Plato's words, the result of taking twice $^{9}/_{8}$. But as the Greeks were always conceiving of numbers as structures, it was impossible for Plato not to take 9 as 3^{2}, and therefore as a continuation or a further outgrowth of one of his primary principles (the number 3), and similarly not to take the tone $^{81}/_{64}$ as corresponding to 3^{4} (cf. what we shall say below, p. 30, about the « nude » series of fifths of A. von Thimus). Even if Plato did not really have in mind powers exceeding the third degree (this degree representing the solid, see above, p. 7), he must have thought of linking together consecutive groups of three powers. Now comparing the three tone qualities contained in the « skeleton » with those of the scale obtained, we see that the former have been augmented by four. There were 3^{-1} (the tone *h*), 3^{0} (*e*) and 3^{1} (*a*); to them are now added 3^{2} (*d*), 3^{3} (*g*), 3^{4} (*c*) and 3^{5} (*f*). Represented as they are here by *h e a d g c f*, with *d* as centre, these seven qualities conform to the criterion stated above. That is precisely « diatonism » or « heptatonism ». The fact that octave periodicity was safeguarded in the corresponding form of the skeleton, is now reflected by the fact that the filling in of the other tones produces no contradiction between different octaves, or no « accidentals ». As concerns the mathematical representation, the filling of the skeleton *h* $(=3^{-1})$, *e* $(=3^{0})$, *a* $(=3^{1})$ by the tones *c* $(=3^{4})$, *d* $(=3^{2})$, *f* $(=3^{5})$ and *g* $(=3^{3})$ would produce the series 3^{-1} to 3^{5}. Yet that would not be the proper representation corresponding to our desire for symmetry; from this point of view we must shift the series from 3^{-1} - 3^{5} to 3^{-3} - 3^{3}, assigning to *d* the rôle of centre (3^{0}) and to *h* and *f* that of extreme terms $(3^{-3}$ and $3^{3})$. Here we take the scale as a form and its components as qualities, and in this sense we must no longer cling to the unilateral, genetic procedure

by which we formerly derived a series whose extreme terms were marked by $1 = 3^0$ and $27 = 3^3$. In the case of *frequency numbers* — which is, after all, more probable — the series will have to be inverted thus:

$$f = 3^{-3},\ c = 3^{-2},\ g = 3^{-1},\ d = 3^0,\ a = 3^1,\ e = 3^2,\ h = 3^3$$

II). Row II of our scheme would, on the above premises, produce the following scale:

G 27 *A B c d es f g a b c' d'* 9 *e'* 8 *f' g' a' h' c'' d'' e''* 4 *f'' g'' a''* 3
h'' c''' d''' e''' 2 *f''' g''' a''' h''' c'''' d''' e''''* 1.

Again there are 34 tones, but not the same ones. In taking this scale as a whole and not in single octaves, we see that the letters adopted do not agree with our criterion. The series of tone qualities from *h* to *es* comprises *nine* degrees, and these, disposed symmetrically with *d* as centre, would have to be designated by symbols ranging from *fis* to *b*; the lowest tone would have be denoted by *D* and the highest by *h''''*. To the tones contained in the skeleton which, in this case, are five (3^{-1} = *fis*, 3^0 = *h*, 3^1 = *e*, 3^2 = *a*, 3^3 = *d*), again four have been added: 3^4 = *g*, 3^5 = *c*, 3^6 = *f* and 3^7 = *b*. Again, in order to agree with the musical structure of the scale, the proper mathematical expression will have to be shifted from $3^{-1} - 3^7$ to $3^{-4} - 3^4$, and consequently 3^{-4}, 3^0 and 3^4 will respectively correspond to *fis*, *d* and *b*. Yet in the case of *frequencies* the series would be inverted:

$$b = 3^{-4},\ f = 3^{-3},\ c = 3^{-2},\ g = 3^{-1},\ d = 3^0,\ a = 3^1,\ e = 3^2,\ h = 3^3,\ fis = 3^4$$

The breach of octave periodicity, present already in the skeleton of this scale, appears now clearly as a contradiction; it is illustrated and concreted by the fact that in one octave there is *f* and in the other *fis*, in one *h* and in the other *b*. We could call it, in the terms of Cleonides (see *Der Toncharakter* p. 352), a « composite system with three Mesai »: the (dynamic) Mese which normally corresponds to the *a* quality would be represented in our series by *e* in the higher, *a* in the middle and *d* in the lower region. Wet we can not really say that the three « diatonic » systems, with *a*, *e* and *d* as Mese, are composing a nine tone-system, because nine

tones are never present in one octave and they are rather an assembly of disparate octaves. Or to put it otherwise, it is a « modulating » system, and modulating twice, always from one heptatonic to the other. In this sense it could be doubted whether we have a reason for changing the transcription of the whole from *h — es,* asymmetrical, to *fis — b,* symmetrical; indeed, it could be argued that they do not form a whole. But even if modulating, i. e., passing from one system to another, it is logical to have that one which is in the centre, written « without accidentals ».

I). Given always the same premises, our first skeleton would produce:

G 27 *As B c d es f g a b c' d'* 9 *e'* 8 *f' g' a' h' c''* d'' e'' 4 f''
g'' *a''* 3 *h'' c''' d'''* e''' 2 *f''' g''' a''' h''' c'''' d''''*
e'''' 1.

There are 34 tones as before. Taking again the scale as a whole, we see that the series from *h* to *as* corresponds to *ten* tone qualities — an even number. It may therefore be shifted in two ways, the center falling in either case between two notes: if it is written as ranging from *fis* to *es,* the center would be between *d* and *g,* if from *cis* to *b,* the center would be between *d* and *a*; in the former case the lowest and the highest tone would be *D* and *h'''*, in the latter *A* and *fis''''*. (Among these two representations we should perhaps prefer the former, because the Greek conception was inclined more towards « flats » than « sharps », as exemplified by their « modulating » scale which connects not *f* and *fis,* but *b* and *h*). Again we see how the breach of the octave periodicity, present in the « skeleton », is equivalent to inner contradiction. Whereas in the skeletonic stage we had 3^{-1} (*fis* according to the transcription preferred by us), 3^{0} (*h*), 3^{1} (*e*), 3^{2} (*a*), 3^{3} (*d*) and 3^{4} (*g*), now to them are added 3^{5} (*c*), 3^{6} (*f*), 3^{7} (*b*) and 3^{8} (*es*). In accordance with this we shall again shift the mathematical representation from 3^{-1} = *fis,* 3^{3} = *d* and 3^{8} = *es* to 3^{-4} = *fis,* 3^{0} = *d* and 3^{5} = *es*. We can even say that the proper representation would be to give to *fis* not « minus four » as power exponent, but « between minus five and minus four », to *d* « between minus one and zero », and to *es* « between four and five »; nay, even the tone which we have marked by *d* is, after all, not *d* but « between *a* and *d* », etc. Yet all this is rather theoretical, as in fact the ten qualities are not operating

together (and in so far they are not real qualities). Here we have, in the terms of Cleonides, a « composite system with four Mesai », the Mese being shifted from *a* to *e* in the high region and to *d* and *g* in the low (according to the transcription we have preferred). Again, if we assume frequencies instead of string lengths, the order would be inverted:

es = 3^{-6}, *b* = 3^{-4}, *f* = 3^{-3}, *c* = 3^{-2}, *g* = 3^{-1}, *d* = 3^{0}, *a* = 3^{1}, *e* = 3^{2}, *h* = 3^{3}, *fis* = 3^{4}.

But we have yet to add an observation. There is still a method by which we could fill out the fourths diatonically without compromising octave periodicity (and, consequently, unity of diatonicism). As we saw, the breach of diatonicism, i. e., the surpassing of the number of seven different tones in I and II, was caused by the fact that, while in case III there were only two fourths repeated from octave to octave (say *h* — *e* and *e* — *a*) and these were limited by three different tones, in case II there were four, and in case I even five (the number of limiting tones being always greater by one than the number of fourths). All these fourths, when juxtaposed in one row, can be denominated, e. g., as *h e* — *e a* — *a d* — *d g* — *g c*. It is clear that when going beyond two fourths the result is breach of diatonicism if the fourths are filled out in an *uniform* manner: say, if they were all « Dorian » as in our previous examples, or if they would be all « Phrygian » or all « Lydian ». But it is understood that we could avoid the breach by giving to the different fourths *different* diatonic forms, e. g., if having given to *h e* and *e a* the « Dorian » form with half-tone in the lower part, we should give to *a d* and *d g* the « Phrygian », with half-tone in the middle, and to *g c* the « Lydian », with half-tone in the upper part. Yet that would only mean transferring the contradiction to another plane: in this case the uniformity of disposition which also is inherent to the idea of scale would be repudiated.

It is interesting to note in this connection that commentators have not always been in agreement in deciding for the « Dorian » form, though such, in general, has been the case with modern commentators. In fact, as we shall see, Pseudo-Timaeus, Proclus and Psellus leave the question open between Dorian and Lydian. Plutarch who, as we have said, supposes frequency numbers, has the Lydian tetrachord (see Ch. 18 of his commentary), precisely that which seems the most natural from the modern point of view (1: $^{9}/_{8}$: $^{51}/_{64}$: $^{4}/_{3}$ = *c d e f* or *g a h c*). And still more interesting,

he tells us (Ch. 19) that other people used the tetrachord with the half-tone in the middle.

It is understood that in all this the supposition seems to be that one species of fourth is uniformly applied and that it is not a question of finding an expedient for safeguarding diatonicism throughout. Yet whether the breach of diatonicism may be accepted or not, it can be maintained that the « Phrygian » division of fourth, with the half-tone in the middle, appeals in a special manner to our sense of logic. By filling up the fourth by the « Dorian » method we add two tones which are, as to their « character » or their position within the series of fifths, wholly at *one* side of the two tones given (e. g., *e* and $a = 3^{2}$ and 3^{1} would be joined by $f = 3^{-3}$ and $g = 3^{-1}$, supposing, of course, frequencies), and the « Lydian » tetrachord means adding to the given notes two notes at the *other* side (e. g., *g* and $c = 3^{-1}$ and 3^{-3} would be joined by $a = 3^{1}$ and $h = 3^{3}$), whereas, according to the Phrygian method, both added notes are symmetrical on both sides of the given tones (e. g., to $a = 3^{1}$ and $d = 3^{0}$ there would be added $h = 3^{2}$, two degrees at « right » from *a*, and $c = 3^{-2}$, two degrees at « left » from *d*). In short, whereas by filling out the fourth by the Dorian method we displace the centre of our group to « left » or, as I should say, to the « masculine » side, and in the case of the Lydian tetrachord to « right » or to the « feminine » tone qualities, by using the Phrygian method the centre is not shifted.

Of course that holds good also when we combine two, three or more fourths, and therefore I should prefer to fill out our frame of fourths by the Phrygian tetrachord, whether taken from row I, II, or from III. In case I we should obtain:

C 27 *D Es F G A B c d e f g* 9 *a* 8 *h c' d' e' fis' g' a'* 4 *h' c'' d''* 3
|_____| |_____| |_____| |_____| |_____| |_____|
e'' fis'' g'' a'' 2 *h'' c''' d''' e''' fis''' g''' a'''* 1.
|_____|_____| |_____|

or, in case of frequency numbers:

a''' 27 *g''' fis''' e''' d''' c''' h'' a'' g'' f'' e'' d''* 9 *c''* 8 *b'*
|_____| |_____| |_____| |_____|
a' g' f' es' d' c' 4 *b a g* 3 *f es d c* 2 *B A G F Es D C* 1.
___| |_____|_____| |_____|_____| |_____|

In case II:

C 27 *D E F G A B c d e f g* 9 *a* 8 *h c' d' e' fis' g' a'* 4 *h' c' d'* 3
e' fis'' g'' a'' 2 *h'' c''' d''' e''' fis''' g''' a'''* 1.

or, in assuming frequency numbers:

e''' 27 *d''''' c''''' h''' a''' g''' fis''' e''' d''' c''' h'' a''* 9 *g''* 8
f'' e'' d'' c'' b' a' g' 4 *f' e' d'* 3 *c' b a g* 2 *f e d c B A G* 1.

In case III:

F 27 *G A Hc d e f g a hc'* 9 *d'* 8 *e' f' g' a' h' c'' d''* 4 *e'' f'' g''* 3
a'' h'' c''' d'' 2 *e''' f''' g''' a''' h''' c''''' d''''* 1.

or, in case of frequency numbers:

h''' 27 *a''' g''' f''' e''' d''' c''' h'' a'' g'' f'' e''* 9 *d''* 8 *c''*
h' a' g' f' e' d' 4 *c' h a* 3 *g f e d* 2 *cH A G F E D* 1.

After what has been said above, I shall not explain further why I have adopted one method of transcription rather than another. At any rate I repeat that, with the six series noted, it is only a question of illustrating Plato's thought and not of deciding what he must have represented to himself.

The only thing we must still note in this connection is that III, taken in both significations, presents a disadvantage: one of the primary tone, 9, stands not as a « frame » tone delimiting a tetrachord, but only as a tone included in a tetrachord; that is the price for the advantage of octave periodicity. In looking again at our diagram we see that in I and II all the fourths contained in the Platonic division are made use of and all the Platonic points of support stand again as such (of course with exception of the fourth 6:4 ½ and the tone 4½), which is not the case

in III — the difference between I and II being only that the primary tone 27 is in I, employed as delimiting tone, and not in II. The form I, which so largely replaces octave periodicity with fifth periodicity, is much like the scale of *Musica Enchiriadis.*

Summarizing our argument, we can say that Plato not having contented himself with dividing the octave but having divided also the twelfth, has offended against octave periodicity, and the consequence is that if we followed him strictly, we should transgress the limits of diatonicism. It can be doubted whether Plato was aware of all the consequences of what he had said.

IV. *Some Commentators*

As I have said, most of the commentators have neglected to establish a frame of fourths to be filled in, but, having given their allegiance to the primary series 1 2 3 4 8 9 27, they filled in whole tones (9:8) and limmata (256:243), forming fourths and fifths rather as they pleased.

Boeckh is, as has been intimated, in this respect an exception. It is true he does not present the division by fourths in his scheme on p. 161, but such a division is presupposed. His disposition is the same as that of our row II, but with two differences: 1) he includes the fourth 6:4 ½ concurrently with $5\,{}^{1}/_{3}$: 4; 2) he includes does not present the division by fourths in his scheme on p. 161, but such a division the tone 16; why? for obtaining, as he says, the fourth octave from 1, but in fact he wishes also to agree with Pseudo-Timaeus, as we shall see forthwith. The first produces, as has been said above (p. 11), a tone « chromatically » opposed to one contained within $5\,{}^{1}/_{3}$:4; the consequence of the second — not made evident by Boeckh — is that there is virtually inserted a new tetrachord (12: ${}^{27}/_{2}$: ${}^{243}/_{16}$: 16) which again interferes with one already present (${}^{27}/_{2}$: ${}^{243}/_{16}$: ${}^{2187}/_{128}$: 18). In this way Boeckh obtains 36 tones (instead of 34), a number upon which stress has been laid by some ancient commentators. Of course, like nearly all modern authors, he is convinced that Plato supposes string lengths, and therefore his series is *descending* from 1 to 27 (or from 384 to 10368, as he, in agreement with ancient authors, puts it, in order to avoid fractions); Boeckh, like most modern authors, is also of the opinion that it must be the « Dorian » tetrachord. We should have, then, his scale if in the one noted above (p. 19) we inserted *e* and *b'*, if we united by brackets *e* with *a* and *a'* with *d''*, and if we transposed the whole series three octaves lower. We see that the number of differing notes remains the same, nine; and as they range from *h* to *es*, they must, as has been observed, be shifted to *fis* - *b*.

The earliest commentary on *Timaeus* come down to us, though not the earliest known, is attributed to *Timaeus*, one of the interlocutors of Plato's dialogue itself: a forgery intended to give the impression that it had served as model for Plato's dialogue, whereas it is really an abstract from the latter. (It has been published in some of the editions of Plato's works as an appendix to the *Timaeus*, as, e. g., in the

fourth volume of C. F. Hermann's edition). R. Harder (in Pauly-Wissowa) distinguishes between two versions of this treatise, one dating from the first century B. C. and one from the first century of our era; according to him, the claim of Timaeus' authorship is put forth only in the second version, while the first was an unpretentious paraphrase of Plato's dialogue.

This treatise gives a very short account of what is supposed to be Timaeus' system of psychogony. It states that the first number (Plato's 1) must be represented by 384 and that, taking the « double » and « triple » intervals with their partitions and filling in the whole tones, there will arise 36 terms, the sum total of which is 114695. Now that is also the sum of Boeckh's 36 terms. But Pseudo-Timaeus does not say by which means he derived his terms from the primary numbers. Of course he also leaves in suspense the question of string lengths or frequencies, as well as that of the tetrachord species.

Now in Hermann's edition of that treatise a *scheme* is added on p. 410 which gives the whole series, still not as divided by tetrachords but only distributed among the seven primary numbers. As this scheme is presented in the edition not clearly and even incorrectly, I shall reproduce it here in order to show how the thing was represented in ancient times:

First number 384, 432, 486 (h) 512, 576, 648, 729 (h)
Double of first number 768, 864, 972 (h) 1024
Triple 1152, 1296, 1458 (h)
Quadruple 1536, 1728, 1944 (h) 2048 * 2304, 2592, 2916 (h)
Octuple 3072
Ninefold first number 3456, 3888, 4374 (h) 4608, 5184, 5832 (h) 6144 *
Ninefold second number 6912, 7776, 8748 (h) 9216
Twentysevenfold first number 10368.

(by h we indicate the half-tones or limmata). It is curious that 18 which is not one of the primary numbers inaugurates a special row, namely, as « Ninefold second number »; the reason is perhaps purely graphical, as the line beginning with « Ninefold first number » was exceedingly long. There are 34 terms and they are counted as such; their sum is 105947. Yet at the places indicated by * there are inserted above the line the numbers 2187 and 6561 which are to their neighbours in the relation of Apotome and Limma. As they are not counted with the others, they must be a later addition and therefore this scheme could not originally have belonged to the treatise. Taking the 34 terms with the two interpolated, there are 36 which produce as sum 114695; we see that the interpolation makes the scheme agree with what is said in the text of the treatise. And this interpolated series is precisely Boeckh's (yet the 34 terms are not the same as those obtained by excluding from Boeckh's series the superfluous tetrachord and the added tone which we discussed above p. 24, i. e., the terms derived from our row II; for the present scheme has as sixth term from the end 6144, while there it was 6561).

The number of differing notes (tone qualities) contained in this scheme is eight. In supposing string lengths, we should write it as $G - e''''$, with h within the three

octaves $e'''' - e'$ and with b below; supposing frequencies, it would be $F - d''''$ with b in the three lower octaves and h in the two higher. The two interpolated notes would augment the number of tone qualities by one; they would be *es* and b' in case of string lengths, producing of course Boeckh's scale which, however, we have preferred to shift to $D - h'''$, with *fis* and *b;* they would be *fis*$'''$ and h' in case of frequencies and in this case we should preserve the notation as $F - d''''$.

The next commentary, chronologically, is *Plutarch's* (about 100 A. D.) who, as has been said above p. 15, supposes frequency numbers and the « Lydian » tetrachord. He jumps from the primary series straight to the division of the fourth as such, without establishing the relative sites of the tetrachords (I refer to Ch. 16 ff. of his commentary). This procedure may seem very general and too cautious. Yet we must acknowledge the very fact that Plutarch occupied himself with the fourth; and as to establishing a frame of fourths, he may have been too well aware of the thorny difficulties which Plato poses in this way.

Proceeding chronologically (though a complete survey is not here proposed), the commentary of *Proclus,* the great Alexandrine of the 5th century, comes next. Proclus discusses the Timaeus scale at great length (191 E - 198 B, 211 F and 212 E).

We have already mentioned (p. 10) that Proclus does not care about establishing a frame of fourths and he alters Plato's « fourths » to « fourths and fifths ». Now we must in detail see how he proceeds. But first the text must be established in the passage 196 E — 197 B, where the terms are enumerated. We see in the latest edition (1904) that in 197 B six words have been bracketed and six others added, with the result that the term 4374 is replaced by 4096; in a foot-note the editor says candidly that Proclus himself may have erred. Now it is amazing that the editor did not see that this passage needed no emendation and that another passage is evidently wrong, namely 197 A, where the text runs: « adding to 1536 the next term by 9:8 we obtain 1728, adding to this number 9:8 would be 1944, *to this 9:8 is 2187,* to this limma is 2048, etc. ». Evidently the words which we give in italics and which, by the way, are missing in one of the manuscripts, should be cancelled, because 2048 is limma to 1944 and not to 2187. With this correction, and leaving the former passage as it stands, we obtain the number of terms and their sum as required, i. e., 34 and 105947; moreover we are in accordance with the scheme added to the Pseudo-Timaeus treatise.

Now we shall follow Proclus in his procedure. The disposition of his scale, as far as he indicates it, may be seen in row IV of our scheme.

Proclus makes a good start (194 B) by exposing the double division, arithmetical and harmonic, of all Plato's octaves and twelfths (according to row I in our diagram). This series is transformed into integer numbers and given as 6 ... 162. Then, having stated that, to insert the smaller intervals, we must replace 1 (or 6) by 384 (194 C), Proclus (194 D) puts down the first octave as follows:

384 432 486 (h) 512 576 648 729 (h) 768

(what his division of that octave is we shall see later on). Proclus then (194 E-F) gives again the double partition of every octave and every twelfth. There follows a discourse about Limma, Apotome and even Comma (is it really Proclus' or an in-

terpolation?), and then (196 E) he turns to the question of constructing the scale, mentioning a diagram but supplying us with none.

In this passage Proclus again expounds the terms of the first octave, as given above and this time he establishes its division, yet not, as we should expect, into fourths with a whole tone between them, but into a fourth and a fifth (384 - 512 - 768). Nevertheless, Proclus, like a too conscientious philologist, repeats that 512 and 576 are the two means. In adding the fifth 768 - 1152 he states that the limit of the first twelfth has been attained, after which (197 A) the fourth 1152 - 1536 completes the second octave. The terms of the third octave, 1536 - 3072, are stated without subdivision; within this series occurs the contradiction that I have tried to remove by text emendation. In going on to the next term, 3456, Proclus (197 B) states that the limit of the second twelfth is attained. From 3456 the series goes on to 6912; that is an octave and again its division is not stated (in this passage, the text is, as we have seen, *not* in need of emendation); this octave, with the adjoining fifth 6912-10368, constitues the last (third) twelfth. As we see, the last (fourth) octave is not adjoining to the third which was 1536 - 3072, but is separated from it by a whole tone: instead of 3072 - 6144 it is 3456 - 6912, and thus the last octave is subordinated to the last twelfth. That is in accordance with the primary series of Plato who, although the number 16 is virtually present within the range 1 - 27, disregards the fourth octave (8: 16 = 3072: 6144).

The series as given is confirmed by Proclus (197 C) by the statement that it contains 24 whole tones and 9 limmata. It is further confirmed by the passage 212 E where Proclus establishes the sum of his 34 terms as 105947. And it is furthermore supported by its agreement with the scheme quoted above in connection with Pseudo-Timaeus which produces the same sum; the latter scheme may therefore serve to supply the diagram missing in the text of Proclus.

The text of Pseudo-Timaeus is opposed by Proclus (197 D - E) who maintains that the number of terms is not 36 but 34; Proclus' argument is that Plato does not mention Apotome but only whole tones and limmata (see above p. 11). But it is curious that elsewhere Proclus appears to be much more conciliating. In 211 F he says that the diagram contains 34 *or 36* terms and that, as 34, 36 may be considered as appropriate to the Soul. He even contradicts himself (195 D - E) by quoting the term 2187 which, as we have seen, is not rightly included in his series, and by adding: « we shall need it in the diagram ». It is impossible not to see in this the hand of a corrector adapting Proclus' text by alteration and interpolation to the number of 36 terms, as required in the treatise of Pseudo-Timaeus (also the discourse about Apotome and Comma 195 D - 196 C, mentioned above, is superfluous if Apotome is not admitted in the diagram).

The surprisingly tolerant attitude of our text towards the number of 36 terms appears even in the same passage where Proclus opposed this number: in 197 D there is said that other interpreters who wanted to have in the diagram not only limma but apotome, have added two terms; and 197 F — 198 A these are specified as 2187 and 6561, the first being in apotome relation to 2048 and the second to 6144. We see these additional terms are exactly the same as those inserted in the scheme added to Pseudo-Timaeus.

As could be expected, Proclus does not say whether he means string lengths or frequencies, yet the tetrachords occurring in his series show at least that he places the limma at the limit of the fourth, i. e., as lowest or highest. I see that Vincent, p. 178, ascribes to Proclus a constructive method that would be rather complicated, though consistent in itself: having filled out the first twelfth with tones proceeding from the division of the octave (the series from 384 to 768 as above, but continued to 1152), Proclus would treble the single terms for obtaining those between 1152 and 3456 (= 3 and 9 in the primary series), and would treble them once more for obtaining those contained between 3456 and 10368 (= 9 and 27 of the primary series). This I can not find in Proclus' commentary and, moreover, it would not produce the sum 105947.

The scale set forth by Proclus is, as has been said, the same as that of the scheme added to Pseudo-Timaeus which contains eight different tone qualities; but while in the latter no division is marked except that by the seven primary tones, Proclus' division is that represented in our row IV. However, this division is, from the point of view of a musical scale, not logical: we do not see why the first octave is divided as fourth and fifth and the second as fifth and fourth; in the following octave no division is established; and the next octave which is again given without division, is, as we have noticed, « disjunct », i. e., separated by a whole tone from the foregoing, a feature unheard of in the history of musical scales. On the whole we have the impression that Proclus is not much concerned about musical reality, and this may be characteristic of him as Neoplatonist. We must further notice the way how he urges upon us the purely intelligible character of musical harmony 199 D ff., where the intelligible is emphatically opposed to the perceivable. It is the same decayed form of Platonism which strikes us in S. Augustine (but, curiously enough, not in the Greek fathers as Basilius, both Gregories, and Maximus); indeed in the conception of Augustine, follower of the Neoplatonist Plotinus, intelligible and real music appear as infinitely distant from each other.

We have now to mention the small treatise devoted to Plato's Psychogony by the Byzantine Michael *Psellus,* late in the 11th. century, and edited by Vincent, 316-332. Psellus quotes Proclus at length, but only the preliminaries of Proclus' dissertation, up to 195 A, which include the modelling of the first octave and the double division of the octaves and twelfths, finishing with the statement that there are 24 whole tones and 9 limmata. To this Psellus abruptly adds his diagram; but this is at variance with Proclus' scale. Probably Psellus found it too laborious to follow Proclus in the details of his expositon, or was he discouraged by the contradictions of Proclus' text; therefore he proceeded as a compiler, inserting what seemed to him plausible. His diagram differs from Proclus' scale, in so far as it has 2187 instead of 2048 (yet 2048 is inserted above the line), and also the division is different (see row V in our diagram). There is more of musical logic in his than in Proclus' arrangement. From the tone 384 (= 1) onwards there are first two octaves divided as fourth and fifth, then two octaves divided as fifth and fourth; the beginning of the next octave is again a fifth, followed by a whole tone. We see that there is some symmetry in this grouping. The division of each of the octaves by the fifth on equal terms with the fourth is Byzantine (we remember that Proclus had already had an

eye out for the fifth, and this may be significant, as Alexandrine is pre-Byzantine). The symmetry of Psellus' construction appears also in the fact that, in supposing string lengths, the upper octaves will contain *h* and the lower *b*, or in supposing frequency numbers it will be the reverse. There is nothing to show us whether Psellus may have thought of string lengths or frequencies; yet it is, as in the case of Proclus, clear that the tetrachords are supposed to be either « Dorian » or « Lydian ».

As the system of Proclus (and that of the scheme added to the Pseudo-Timaeus), that of Psellus contains eight different notes (or powers of 3) which we should represent as ranging from *b* to *h*. That is, in terms of Cleonides, a « composite system with two Mesai » and it would correspond to the Greek « systema metabolon » (modulating system), but with the difference that in the latter *b* and *h* are alternative notes within one octave, while with Psellus they are located in different octaves.

As to modern commentators we have already referred to Boeckh. *Vincent* (p. 176 ff.) should also be adduced as a thorough commentator and connoisseur of Greek musical theory. He has, as to the Timaeus scale, his own theory which is not devoid of logic, although it is not adapted to the division of octaves and twelfths as given by Plato. His meaning, in the way it is formulatel, is rather difficult to understand; still, it is evidently the following. He subdivides the first octave strictly in accordance with Plato's division as $1:1^1/_3:1\frac{1}{2}:2$, but then he proceeds independently, without looking at the (incomplete) frame presented by Plato. Having filled out the fourths $1:1^1/_3$ and $1\frac{1}{2}:2$ in the normal way and obtained eight terms in the first octave, he doubles these terms for filling the second octave, and he doubles them once more for obtaining the terms of the third octave. Then the interval 1:3 is taken and again subdivided according to Plato as $1:1\frac{1}{2}:2:3$, which produces twice the fifth and once the fourth; and now, contrarily to Plato's instruction which provided only the filling out of fourths but in accordance with Proclus and Psellus, the fifths within this twelfth are filled out with whole tones tones leaving a limma, as in the case of the fourth; these twelve terms are tripled for obtaining those from 3 to 9 and again tripled for obtaining those from 9 to 27. We see that Vincent takes the first octave and the first twelfth as a nucleus which he subjects to a constructive, but rather theoretical idea of his own. Of course, some of the terms obtained result as well from the division of the octave as from that or the twelfth. On the whole there are 39 terms, and apotome occurs rather often (chromaticism in the modern sense). There are *ten* different tone qualities or powers of 3, as in the case of our row I when it was filled out. Of course Vincent supposes string lengths. The result would be a scale extending from *D* to *h'''*, with notes ranging from *es* to *fis*. But in the realization of his idea Vincent is not consistent. Here intervenes the idea of the « conjunct » (or modulating) Greek system with *eight* different notes ranging from *b* to *h*; and therefore in the sector of two octaves which is represented on p. 183, two of the tone qualities (or powers of 3) are omitted. It is curious that Vincent was not aware of Boeckh's interpretation.

Although it is manifestly wrong, we shall now consider the explanation given by *A. von Thimus,* because he is a distinguished thinker and because he bases himself on the continuation of Plato's story which is in itself interesting to us. In

fact Plato, after having said that the Creator filled all the 4:3 with 9:8, producing in every one a rest interval of 256:243, goes on to connect his musico-arithmetical series with cosmology. We remember that in this method of thinking astronomy has always been associated with music and mathematics; and the latter being diversified as arithmetic and geometry, there results the fourfold group: arithmetic, geometry, music, astronomy, which later on constituted the so-called Quadrivium. Plato says that the mixture having been used up (as we have seen), the Creator split up the whole structure longitudinally in two strips, then putting the middle above the middle, as in the Greek letter Chi (X), he bent both of these strips making each of them into a circle; and making one circle the outer, the other the inner, he conferred to the outer movement — the circles are, then, rotating — the nature of the Same and to the other that of the Other; then leaving the outer circle unsplit he split the inner sixfold; thus he produced seven circles distant by double and triple intervals (as we see, the series 1 2 3 4 8 9 27 comes again into play), these being the orbits of the seven planets disposed according to their distance from the earth, and that distance being taken as 1 in the case of the Moon and 27 in the case of Saturn. This had been correctly interpreted already by Boeckh. But Thimus does not agree (II 213 ff. and I 157 ff.). In spite of Plato's clear statement, he fails to realize the double division of octave and twelfth. He starts from the two strips just mentioned, putting down one of them as 1 2 4 8 and the other as 1 3 9 27, and completing both by reciprocal fractional numbers in this way:

$$1/8\ 1/4\ 1/2\ 1\ 2/1\ 4/1\ 8/1$$
$$1/27\ 1/9\ 1/3\ 1\ 3/1\ 9/1\ 27/1$$

To these rows Thimus applies the crosswise superposition and he joins them by crosswise multiplication, obtaining the series:

$$8/27\ 4/9\ 2/3\ 1\ 3/2\ 9/4\ 27/8$$

which, musically speaking, is nothing other than the diatonic (heptatonic) system, or the series of seven tone qualities arranged in fifths: *f c g d a e h,* which can be symbolized also by $3^{-3}\ 3^{-2}\ 3^{-1}\ 3^{0}\ 3^{1}\ 3^{2}\ 3^{3}$. The result of this system is indeed the same as that of Plato's, that is, gradation by fifths, but Plato does not state it so nakedly. These *fifths* are, in Thimus' opinion, the « double and triple intervals » to be divided arithmetically and harmonically (because the fifth is equal to 3 divided by 2!), and this double division gives major and minor chords in the modern sense (cf. below, p. 38); only the *thirds* contained in these chords would have to be filled out by 9: 8. That is interesting but very aprioristic. By assuming frequency numbers Thimus is again at variance with all the other modern commentators, but in this we can not wholly disapprove of him.

Finally, there is the learned commentary given by *Taylor*. Having transformed the primary series, as the ancient authors do, in 384 - 768 - 1152 - 1536 - 3072 - 3456 - 10368, Taylor (p. 143-145) proceeds directly to realize the division by whole tones and limmata without keeping to the skeleton series which Plato derives by arithmetical and harmonic partition. The basis on which he applies his division by whole

and half tones is just the idea of diatonic scale which juxtaposes within the octave two fourths and one whole tone. Taylor even narrows down this idea, without apparent reason, to an octave with the fourths as extremes and the whole tone in the middle. In consequence he has a frame of fourths, but it is his own; as it subjects itself to octave periodicity, it coincides practically with our row III (the least orthodox of the three). Taylor then goes on to establish what was exactly Proclus' disposition. He determines it in starting from the sum 105947 as given by Proclus, and the result is right, but it is attained by comparison of that sum with Taylor's series, not, as we should expect, with the scheme added to Pseudo-Timaeus' treatise. Again when polemizing with Pseudo-Timaeus, i. e., *prò* 34 terms and *contra* 36, Taylor does not avail himself of the scheme. He explains the difference between Proclus' scale and his own by assuming that Proclus was induced by the wording of Plato to continue inserting whole tones so far as it was arithmetically possible (always supposing 384 to be the first term and admitting only integer numbers); but this, I fear, is a misinterpretation, as Plato does not say « as far as possible » but « as far as possible within the fourth » and, moreover, Plato does not put down the terms in the multipied form from 384 to 10368. After all that has been said, I think Taylor is too confident when he is « sure that the series intended by Timaeus (the interlocutor in Plato's dialogue) is either that of Proclus » or his.

V. AN APPRECIATION OF PLATO'S STANDPOINT.

As we have seen, Plato is not scrupulous about concrete details. In a rather imprecise way he behaves as if by dividing his octaves and twelfths harmonically and arithmetically he would already possess the frame of a scale divided by fourths; and as to the filling out of the fourths, he says only that there must be two intervals of 9:8 and one of 256:243. In reality it is not a scale which Plato sets forth but only the *principles* of a musical scale, and these are: 1) the division of the series by agency of the consonance and, especially, the fourth, 2) diatonicism, this, of course, being not a feature proper to every scale, but to the normal one: at least that which we consider as normal and which the Greeks considered as such, notwithstanding their use of the « chromatic » and the « enharmonic » genus, with many intermediate shades, all of which are probably to be interpretated as « colourings » of diatonicism. (In fact it is testified that the diatonic genus seemed to them the most natural and the most easy, and that it was the most common).

As observed above, p. 7, the reason why Plato's seven primary numbers do not go beyond the third power is not a musical but rather a symbolical one. It is probably his tendency to geometrical representation: as this is limited by three dimensions, it can not represent more than cube numbers or, in general, more than num-

bers composed of three factors; in this the geometrical representation of tone is more limited than the arithmetical. We have further noticed (p. 27) that 16, the fourth power of 2 and the fourth octave, is virtually included within the range 1 — 27, but Plato does not set it off, and that probably for the sake of aesthetic symmetry, as 1 3 9 27 is in a way one side of a triangle and 1 2 4 8 the other. But in reality, as we have observed (p. 7), already the seven terms as put down by Plato include four powers of 2 and of 3, as the number 1 too is a power of 2 and 3. We had further noticed that Plato does not engage in a comparative appreciation of the rôle of his constitutive elements, the Two (octave) and the Three (fifth), of which the latter stands foremost in the aspect of real musical qualities, nor does he notice that they are in a way antagonists (see above, p. 14 and p. 24). We have also observed that further powers of Two, and especially of the decisive Three, are admitted by Plato *implicitly* (p. 18). All this is, I think, a sign that Plato proceeds as an artist who presents his thought in the form of a fable.

In other words, Plato does not go on to *concrete* what he has said. But this does not mean that what he has said has no real significance. It is the principle of a *real* scale, considered as normal, which he exposes, and here he is right in establishing first the general principle of consonance, then a first division of primary consonances which, curiously enough, is pentatonic (see above, p. 8); then, in a leap, he purports to have erected a frame composed of fourths, and these fourths he divides quite normally by inserting whole tones. Surely those were principles of scale construction which had been established long since.

It is, then, not at all a « phantom » (« Hirngespinst ») which Plato presents to us, as has been asserted in a rather sensational and mischievous book, published 25 years ago, titled *Plato und die sogenannten Pythagoreer:* a book which of course (of course!) has exerted a great influence upon philosophers and writers on music, nay even upon the flock, reputed to be cautious, of philologists.

Indeed concreteness is not reality: but that is just the confusion so widespread in our modern era. Plato looks at the real world as it is, and does not resort to abstractions like matter which is not form, or the idea of sensuous perception in which no element of reason is present. That which is fundamental to him is the correspondence between our apparatus of cognition and the object of this cognition (a correspondence which exists by principle and does not exclude error in a given case); and this he is not, as we are not, able to trace back to anything else than the creative act of a transcendent being. Precisely because that is Plato's meaning and because he thinks that idea and reality are in their inner-

most in accordance with each other, his example of a scale, as his examples in general, can not be a mere « phantom », contrived arbitrarily; he is, in other words, not a Kantian of the 19th century.

The allegation of « phantom » is supported by another erroneous assertion which also has (of course!) had a widespread echo: according to this the Timaeus scale (or quasi-scale) would be wrong in its root because it bases its structure only upon octave and twelfth (or fifth) and not upon the « natural » third, which implies the following prime number, 5, 4:5 representing the major third and 5:6 the minor — the tone relations so prominent in Western music of later times. Here the author of the « phantom » theory confounds what is peculiar to a given musical era and what can be stated generally. The « natural » third, which establishes a « direct » link between tones distant by a third, does of course impose itself as a consonance in a musical culture as ours, that adheres so exclusively to simultaneous harmony (cf. *Der Toncharakter* § 13), but it plays only an insignificant rôle in broader musical conceptions. Even as concerns ourselves, it can be demonstrated that, notwithstanding the apparent sweetness and attractiveness of this new consonance, the fifth is yet far more constitutive and fundamental; we must remember, 1) the famous experiments of C. Stumpf showing that even men of our culture are naïvely more apt to mistake as one tone a simultaneous fifth than a third, 2) the fact (on which I laid so much stress in *Der Toncharakter*) that in our perception the differences of tone quality (as distinct from pitch) are still in the main based on the series of fifths.

I am glad to note that at last the view that the « Timaeus scale » is quite arbitrarily conceived seems to loose its credit, as I see in a paper by B. L. van der Waerden in *Hermes*, LXXVIII, 1943. But on the other side a book about musical psychology which appeared in 1947 bears still witness to the havoc caused by the aforesaid book: not only does it repeat the wrong assertions referred to above (as well as another which we shall forthwith cite), but it combines them into a new error: that Aristoxenus was a champion of the third as a consonance (and as such — of course — a champion of musical progress).

The other wanton assertion of that book, and one which has found an applause even more unanimous, is this: Plato would do violence to music and mistake its substance and nature, since he considers tones as quantities and not as qualities, and only Aristotle and Aristoxenus would have done justice to the qualitative character of musical sound. It seems clear that

this assertion depends mainly on a one-sided conception of number, or rather on failure to grasp the Greek conception of it (without which we too really can not do). In that larger sense number is not only measure of quantity, indicating the more or less, but it indicates a structure, and the gradation of powers of 3 is, as we have seen, precisely in correspondence with the musical quality of sound.

This conception is further reflected in the ancient tendency to represent numbers as geometrical figures. The Greeks called « oblong » a number composed of two factors differing by one, e. g., 6 = 2 x 3, or 12 = 3 x 4, which is the counterpart of superparticular ratio (3:2, 4:3, etc.); this produced figures like ⁝ ⁝ (cfr. Th. Heath, *A history of Greek mathematics* I, 1921, 76 ff.). In this sense number was to them really « figure », i. e., form; and what they saw, thus, with their eyes, they perceived with their ears as the musical, qualitative relations of tones. Yet there was a restriction imposed on this craving for visual representation (see above, p. 31): numbers composed of more than three factors could not be represented geometrically. With us, it is by a survival of this ancient conception that we speak of « square » and « cube » numbers.

In fact we can not fail to be impressed by this correspondence which has something of a marvel: not only our perception of musical pitch and tone « distance » is rigorously (logarithmically) in accordance with frequency numbers, but also the structure of the number, apart from its magnitude, is reflected in the musical character of the tone, apart from its pitch; e. g., the tone *e* (which in a system with two « sharps » would be written as *fis*) is, as to its musical quality, precisely as remote from another given tone within the same system, as both are distant from each other according to the series of fifths. In this sense we can say that the tone is symbolized by a power of 3, as well as that it is itself the vivid symbol of the number (as to eventual claims of the number Five to play a similar rôle as the Three, cf. *Der Toncharakter*, § 13).

It has become just a slogan that Platonism considers the musical tone quantitatively and that the qualitative conception of it was introduced first by Aristotle and Aristoxenus. We may just as well say the contrary: that according to the Platonic (and the Pythagorean) view, and in view of the Greek conception of number, musical quality appears as a matter of course, and that it is rather the Aristotelian and especially the Aristoxenian conception that can be suspected of quantitative tendencies. It is known that Aristotle and Aristoxenus, more than Plato, laid stress on the character of number as measure of quantity, homogeneous and unlimitedly

compatible (see Stenzel 59); and it is exactly in correspondence with this conception of numbers when they are inclined to view musical sounds as exponents of a continuous gradation — the pitch gradation of course — rather than as qualities in the proper sense. Now this gradation is akin to one of intensity and, therefore, of quantity. Yet we ought to note that Aristotle was only the initiator of such conceptions which were to be developed and emphasized by Aristoxenus. Aristotle's intermediate and somewhat contradictory standpoint as a musical thinker would make a very interesting subject of study.

In a broader sense we may further note that Plato — at least late Plato — is not a thinker hostile to world beauty, as he is sometimes considered to be. The tendency of fleeing the world, as manifested in Neoplatonism during the late period of paganism, was not Plato's. It is true, beauty is not to him — as it can not be to us — a thing strictly and merely dependent upon sense perception; perceptible beauty depends upon a superior order of things shining through what the senses grasp. That precisely is aesthetic reality, and sense perception devoid of it would be a mere abstraction. As we have seen, the quality of a tone perceived musically is like that of a form or a figure, one quality always being interdependent with others. But the order, shining through our sensuous impressions and transforming them into aesthetic perceptions, points to an absolute Good standing behind all things and which is the source of being. That is why Plato, in his lecture about the Good, resorted to numbers, to mathematics and to the Pythagorean notion of « limit » — a method which, as we are told by Aristoxenus on the testimony of Aristotle, was surprising and disappointing to many of the hearers who had come in order to partake of « goods » like wealth, health and strength.

VI.

ABOUT PROPORTIONS, ARITHMETICAL, HARMONIC AND GEOMETRICAL

But having engaged in polemics with others I do not see why I ought not to seize the opportunity to polemize against myself. There is in *Der Toncharakter* a section devoted to « harmonic partition » and there the « harmonic mean » has been treated in a rather peremptory way as having no real musical importance as compared with the « arithmetical

mean » (p. 211 f.). I think that is to some extent exaggerated and some defence may be made of the harmonic mean if we reflect on Plato's coordination of these two means. Actually the harmonic proportion is not quite so artificial as it appears from its definition (on this see above, p. 8) but it is in a way a reversal and a derivation of the arithmetical. Take an arithmetical proportion with one mean, as 2:3:4, and suppose it is to be reversed, yet not as a whole (4:3:2), but by parts, reversing first 2:3 and then 3:4. The first relation in the reversed form being 3:2 and the second 4:3 we must, for uniting them into one proportion, take the smallest common dividend of 2 and 4, which is 4, and accomplish the corresponding multiplication which gives 6:4 and 4:3, i. e., 6:4:3, precisely a harmonic proportion; as we see, the relation of the outer terms is also reversed in comparison to the arithmetical proportion with which we started. The relation between the two proportions may also be expressed as follows: the reciprocal value of the harmonic mean is equal to the arithmetical mean of the reciprocal values of both outer terms (denoting the harmonic mean by m, its reciprocal value $\frac{1}{m}$ is $= \frac{\frac{1}{a} + \frac{1}{b}}{2}$); or as Proclus says in his Timaeus commentary, 193 B, if in a fourfold proportion like $\frac{a}{b} = \frac{c}{d}$, b is the arithmetical mean between a and d, c is the harmonic, and vice-versa; or again, 196 F, if we take the double and the triple of one term, e. g., 1:2 and 1:3, the arithmetical mean of 1:2 will be the harmonic of 1:3, and the major term of 1:2 is the arithmetical mean of 1:3. In the same way as the arithmetical proportion 2:3:4 produces the harmonic 6:4:3, 4:5:6 will produce 15:12:10, etc. Now what does that mean musically? It means that, the interval between the extreme tones remaining the same, the dividing point is now in relation to the upper what it was in relation to the inferior; e. g., *c g c'* is replaced by *c' f c* or (admitting the « natural » third 4:5) *c e g* is replaced by *g es c:* the component intervals are the same but their order is reversed.

It is easy to see that starting from two given outer terms which differ by one, e. g., from 1:2, in octave relation, or from 2:3, in fifth relation, we find in every case the arithmetical mean by multiplying these terms by two (necessarily so, since the arithmetical mean is, quantitatively, half their sum) and thus we obtain 2:3:4, or 4:5:6, etc. On the other hand we find the harmonic mean by multiplying the outer terms by the arithmetical mean: by 3 in the case of 1:2(= 2:4) which produces 3:6, with 4 as harmonic mean; by 5 in the case of 2:3 (= 4:6) which produces 10:15, with 12 as harmonic

mean; thus, the harmonic proportion is in a way derived from the arithmetical. And again what is the musical meaning of it? As it preserves the same component intervals in reverse order, the harmonic proportion does not render things more « complicated » if we consider the component intervals, but it does so if we consider the whole; indeed in the latter respect 6:4:3 or 3:4:6 is more « complicated » than 2:3:4, and 15:12:10 or 10:12:15 more than 4:5:6.

Therefore it would seem preferable not to exclude the method of the harmonic mean from the scheme of partition established in *Der Toncharakter,* § 21 c). However it must take place behind the arithmetical mean, and we can still maintain that the partition by the latter is the true « harmonic partition ».

The connection existing between arithmetical and harmonic proportion is further illustrated by the fact that an interval sequence which represents an arithmetical proportion when supposing vibration frequencies, produces a harmonic one if string lengths are assumed, and vice-versa. Thus *c g c'* is 2:3:4 as to frequencies and 6:4:3 as to lengths, *c f c'* is 3:4:6 as to frequencies and 4:3:2 as to lengths; *c e g* is 4:5:6 as to frequencies and 15:12:10 as to lengths, *c es g* is 10:12:15 as to frequencies and 6:5:4 as to lengths. That is precisely the consequence of the fact that, in replacing frequenciens by string lengths, we are reversing not only the relation between the outer terms but also that between every outer term and the mean.

Now just as there exists a preponderance of arithmetical proportion over the harmonic, we must concede to frequency numbers a preponderance over numbers representing string lengths. For this there is an evident reason which is, that string lengths are not so directly connected with sound production as are vibrations; therefore the representation of sounds by lengths is to be considered rather as derivative. We may add that string lengths are perceived by another organ, the eye, whereas our perception of vibrations is in a way a « continuation » of our auditory sense. It seems important to note in this connection that the eye is not capable of that spontaneous reaction to simple ratios as is the ear, i .e., it is not struck in the same way as the ear when faced with ratios as 1:2 or 2:3 (see above, p. 5). Thus we may find that the musical ear perceives more qualitatively than the eye; and yet colour as perceived by the eye is the classical instance of the notion of quality! This apparent contradiction is of course solved by recognizing that the notion of quality

may be a little different in both cases: one is the quality inherent in the member of a system in whose erection we take an active part (cf. above, p. 35; yet that does not mean that we may erect it arbitrarily); the other is a quality the foundations of which are infinitely more remote.

But whilst arithmetical proportion prevails over the harmonic, and frequency numbers prevail over string lengths, there is an affinity between arithmetical proportion and frequencies, as well as between harmonic proportion and lengths. It is not to be doubted that of the two tone relations *c g c'* and *c f c"* the former is spontaneously judged as more natural, smooth and « simple » than the latter, as well as *c e g* when compared with *c es g*; now in every case the first is producing the simpler ratios when expressed by *frequency numbers;* and these are in the form of arithmetical, not of harmonic, proportion.

Yet Zarlino (*Istituzioni* III 31) is very proud that in supposing string lengths, as he does, and taking the proportion to which the Greeks gave the beautiful name of « harmonic », he obtains the beautiful major chord (15: 12: 10 by string lengths), whereas the arithmetical proportion produces the minor chord (6: 5: 4). He is not aware that he is twice relying on the secondary: on arithmetical proportion as compared with harmonic, and on string lengths as compared with frequency numbers. He is, in a word, more humanist than thinker. Now as is known, the dispute between adherents and adversaries of harmonic « dualism » in the modern musical theory turns precisely around this question — whether the minor chord is to be considered as a counterpart of the major with equal rights, or rather as derived from it. I think this dispute could be settled by establishing that the relation is analogous to that between arithmetical and harmonic proportion as characterized above: indeed in both cases there is something of a reversal and something of a derivation. Yet I should not like to introduce here questions of « musical theory ». What we ought to be aware of is only that the comparison between major and minor chord (as between intervals and interval sequences in general) will be in its true perspective if we base it on frequency numbers, rather than if we assume string lengths.

Let us yet recall a curious parallel established by Boetius, *Arithmetics* II 45 (probably according to Nicomachus), as to arithmetical and harmonic proportion. He compares the arithmetical mean to the rule of a few men, i. e., oligarchy, because here the greater ratio is with the *smaller* numbers, e. g., in 2:3:4 2:3 is the greater ratio and 3:4 the smaller (we see that a quantitative conception of ratio is intruding here). The harmonic proportion is compared to aristocracy or the rule of the best men, because here the greater ratio is with the *larger* numbers, e. g., in 2:3:6 3:6 is the greater ratio.

But what about the *geometrical* mean? Boetius compares it to a « popular » or « equalized » state, because here the ratio is the same with the greater and the smaller numbers, as, e. g., in 4:6:9. Other writers have stated that the geometrical proportion is not made use of in music. That is surely right in a large measure. In fact when juxtaposing two equal intervals we never attain a higher unity, whether it may be two fifths which produce a ninth, or two whole tones of 8:9 which lead to an interval clearly not « contented with itself » but pointing to a further progression, 64:81. (In this sense the replacement of 64:81 by 4:5 — a third composed of two *unequal* whole tones, 8:9 and 9:10 — means that the third is « closing » on itself). This illustrates the general principle that *different* things, when being in inner agreement, form a harmony (as, e. g., the fifth and the fourth forming an octave); it is the reverse of the principle, touched on above, of « harmonic partition ».

As is known, the geometrical mean is equal to the square root of the product of the outer terms, and finding the middle of two given tones corresponds to extracting this root from the product of their numbers. As this product is, in general, not a square number, this will lead to irrational numbers; and this is exactly in correspondence with the fact that it would be a *tour de force* (yet not a musical feat!) to sing the precise middle of a fourth or a fifth. In practice geometrical proportion and, then, root extraction is applied only where a purely external compromise between tones is established in the sense of temperament. As in this case we start from the octave that has to be divided into twelve equal intervals, it means that we have a geometrical proportion with thirteen members, the outer terms being related as 1:2, i. e., it means the extraction of the root of twelfth degree from 2.

We must admit that Aristoxenus, with his assertion of twelve equal half-tones in the octave, is not far from that conception. (At all events I do not think there is much in it that is « qualitative »!). Yet if we consider what he says, we see that even he does not think of deriving the whole tone in this artificial manner (apart from the fact that he would not have been able to calculate this kind of root). In fact Aristoxenus derives the whole tone, not otherwise than done by Plato, by subtracting the fourth from the fifth, and this means that he is, after all, going back to consonant tone relations, with the only difference that, by some kind of idiosyncrasy, he does not like to connect them with numerical ratios. Therefore his statement that a whole tone is the sixth part of an octave, etc., must not be taken in a genetical sense, but only as an

external approximation: to him the whole tone *represents* the sixth of an octave, as the sixth part of the octave represents a whole tone. Indeed in proceeding from the whole tone to smaller intervals Aristoxenus is more in the pure line of distance equalization; he speaks of halves, thirds and fourths of a whole tone, a quarter of a tone being in his mind the *non minus ultra*. Yet it is not imaginable how he could have determined these smallest magnitudes otherwise than by approximation. Indeed in this realm of minim intervals and, accordingly, of complicated and not obvious ratios, we are more than in the domain of « normal » intervals reduced to pure distance appreciation; but it is rather a question of estimating than of determining, as in this case we have not the obvious points of support imposed by simpler ratios, upon which to rely. This is what could be said in answer to the question whether Aristoxenus knew of equalized temperament.

However there is, in the strictly musical sense, a field where procedure by equal steps takes place and is even essential: it is our series of fifths producing the different musical « qualities ». Indeed here *a* differs as much from *d* by its quality as *e* from *a*. Yet that is not a musical complex in the proper sense but only a system *underlying* such: we may say that an infinite progression by uniform steps being given, we appropriate a sector of it and dispose it according to our symmetrical tendency (cf. above, p. 18). Here we may remember that it is the same with Plato's « three powers of 2 and 3 » representing, in the opinion of Proclus 193 B, the geometrical proportion which « embraces » the harmonic and the arithmetical; this is a *background* of musical reality, as is our series of fifths which has been so much calumniated because misunderstood (as to the Two and its powers we can, as we have seen, disregard them in a strictly musical sense). We must agree with Greek theorists: « popular » or « equalized » rule is not compatible with musical reality. And yet, on the other hand, we must state that a single tone is nothing without a « community » in which it takes its place.

P. S. I. This paper was completed and forwarded to the Editor when I got notice of a paper by Ottavio Tiby, *Note musicologiche al « Timeo » di Platone,* published in « Dioniso », Bollettino dell'Istituto Nazionale del Dramma Antico (XII, 1949), which treats the same subject. The Author introduces a new point of view in the discussion, as he believes that, in order to obtain the scale intended by Plato, we must keep in mind only the division of the three octaves (1 2 4 8), dismissing that of the twelfths (1 3 9 27) with its « disparate and perturbing » elements; in other words, the filling

out of the fourths, prescribed by Plato, would have to be applied only to the fourths resulting from octave division. I take this, from my point of view, as confirmation that Plato's directions are not to be taken too concretely. In the rest I am inclined to adopt, with regard to ancient thought, an attitude less « modern » than the author, i. e., less naturalistic or positivist. As to the « number of Plato » referred to by Cicero as an example of obscurity, I think it is that about which Plato speaks in *Republic,* 546, a passage still much more involved than ours.

P. S. II. As this paper is in some way a supplement to « Der Toncharakter », I may perhaps be permitted to add that this book has been curiously misunderstood in *The Musical Quarterly,* issue of July 1949, by a writer introduced there as « chairman of the Department of Psychology at Princeton University ». According to this writer it is not worth while to discuss further what thinkers, not yet enlightened by modern neurology, have said in regard to the musical quality of sound, and he thinks « progress » can henceforth be achieved only by joining psychology to neurology or physiology — a method happily inaugurated, according to him, about 1925. I should indeed be grateful if he would indicate what this kind of research — surely valuable in other respects — has hitherto contributed to the problems tackled in my book. Although he is evidently well acquainted with it, the writer gives no hint as to this, and thus his attitude remains a purely negative one. He quotes the series *c g d a e h fis cis gis dis ais eis his* with the same misprint as in my book (i. e., without *h*) and charges me with having made this the basis of a tonal system with *d* as the « center of tonal gravity ». But apart from the fact that a tonal system in my sense never extends to so much as 12 or 13 tones, I must state that I never took *d* as a « center of tonal gravity » or « fundamental » tone. These terms, used by the writer, seem to point to a specific conception of harmonics, whereas I have expressly distinguished — in superposing them one to the other — three conceptions: 1) the series of fifths, or rather a section taken from it, within which we naturally take *d* as « central » or « neutral » in respect of tone quality; 2) the « mode » in which any note may be the center of tone relations; 3) the major tonality with *c* as fundamental tone. The writer is at best unprecise when he ascribes to me the assertion that « Toncharakter » is more « fundamental » than any of the other tone attributes. I said clearly that I take it as not being so *elemental* as the others: and which of them we take as the more *important,* depends, of course, on our point of view. The writer — who really mentions Pythagoras as one of the authors from whom I draw my material — seems quite unaware of the fact that our tonal letters have a double meaning, the first and primary: qualitative and relative, denoting the tone character, the other, more recent: denoting « absolute » degrees of pitch — and that I am entitled to use the letters accordingly. We are in agreement in so far as we distinguish those two aspects of tone reality, but he puts more stress on the latter and I, on the former. Be that as it may, I have done without physiology and have therefore to bear the blame of the writer (who, however, could have mentioned that I gave some reasons for my attitude). But when seeing that the writer consigns Hornbostel and Stumpf to the same scrap-heap, I must advance in their defence precisely that for which I reproached them, i. e., that in the last resort even they fell into the error of taking the physiological process as cause or explanation of the psychic; in this

respect the writer fails to recognize the affinity he bears to them. Yet he also charges me with neglecting the *physical* conditions of tone; and here I have the real satisfaction to display a reviewer who represents the opposite extreme and charges me with indulging too much in acoustics (*Schweizerische Musikzeitung*, 1949). However, I hope that the writer will recognize that, even when I dealt with psychology, I was not bound to disregard history. He strives to give his review a witty close by speaking of « unconscious irony » but, alas, that supposes an arbitrary interpretation of the word « Einfuehrung » as used in the subtitle of my book; an introduction is not necessarily a survey; we may, I think, try to « introduce » the reader to a subject from whichever side we choose and « *Einfuehrung* in die Tonpsychologie » is not the same as « Musikgeschichte im *Ueberblick* ». If I have failed in my undertaking — a thing quite possible —, the reason is surely not this.

But ambiguity in expression is a thing I deplore not less than these misunderstandings. What is this notion of a musical psychology (or an area of musical psychology) « chiefly influenced by Stumpf and von Hornbostel »? Is it possible for any musical psychology not to be so in a large measure and has not the writer himself borrowed from Hornbostel the notion of « Tonhoehe » (height) as an intrinsic (not metaphoric) tone property *which I did not?* (Cf. *The meaning of music*, 1931, 52-54; and compare *Journal of experimental Psychology* 1934, 585 ff., for another of these Hornbostelian phantoms taken over by one of the champions of psychological « progress » adduced by the writer). What signifies the allegation that my « factual material draws heavily » upon writers ranging from Pythagoras (!) to Hornbostel? It could mean that I took from them raw material and worked it over, and that would be wrong; or it could mean that I repeated what they have said and that would be wrong as well. The truth is that I have tried to understand the thinkers of the past (which is not, as the writer seems to believe, a matter of course) and to discuss the same problems. And why does the writer mention Stumpf's first great book, the one from 1883, and not the last one, from 1926, if not in order to reinforce the impression that my book is a priori obsolete?

I could add that the review of the same « Toncharakter », published in the *Journal of the American Musicological Society*, II, Fall 1949, represents a progress in comparison to that just discussed, in so far as its author, who has not in reality understood much more than his colleague, candidly confesses that he had difficulties to understand. But what is the reason of these difficulties? I am sure that it is an one-sided training rather than lack of training, and therefore a non-professional reader will, in general, come through much more easily.

J. H.

GOTHIC FORM

A Marginal Note

OTTO GOMBOSI

In our struggle for spiritual contact with the music of the 15th century the old fashioned methods of transcription and editing have been subjected to much criticism and to a few attempts at improvement. The range of recommendations is wide and of course includes the questions of placing of barlines and of the shape of notes to be used. Reduction of original note-values by 1:2 and 1:4 — by one scholar even to 1:8 — has been advocated and tried. Recently, barring according to the *tactus* (Tirabassi - Auda) as well as barring, at least of the lower parts, according to the *modus* (Besseler, Feininger, de Van) have been introduced. The latter method has unquestionably brought about greater clarity of the total picture of a composition.

This writer has expressed his dissatisfaction with most, if not all, ideas of reform[1]. Nor is he in agreement with the traditional method in transcribing. An advocate of a more radical approach, he has published[2], for the sake of argument, one section (Agnus I) of Okeghem's *Missa Prolationum* in a transcription that takes into account the metrical flux of the music rather than the purely mechanical suggestions or the *tempus*. The expected storm of protest has not yet reached him.

With music of a definite metrical pattern, such as certain dance-forms, or the frottola of Jeppesen's Type A[3], some (Einstein, Bukofzer, and others) have come to partly similar results. But this is another story, which will be fully told soon.

For the present, it is proposed to illuminate the importance of interpretative transcribing for the recognition of formal qualities, of the very existence of which we have had up to now hardly any notion.

Certain qualities of form have been, of course, well known for some time. Especially isorhythmic constructions have received much attention. While much, too much, liberty was taken with the use of the word, the essence of isorhythmic structures has not escaped close observtion. Espe-

[1] *Notes*, Second Series VI, 1 (Dec. 1948), 174ff; *JAMS* 1, 2 (1948), 48-52.
[2] *JAMS* I, 2 (1948), 52.
[3] This is the one with the rhythmic pattern

cially Ludwig's editing of Machaut's isorhythmic motets, with its clever typographical indication of the periods, opened many eyes. Recently, Oliver Strunk has called our attention to other faintly similar practices within the cantus firmus Mass[4] in which a balance in formal elements is reached by mathematical correspondences between cantus firmus sections and their repetitions.

Yet all this is just the outer frame and not form. Form has both: an internal organization and a framework. It is still to be seen whether the metrical structure of isorhythmic sections shows any regularity, any planning, and any correspondence with the entire frame. The same question emerges with regard to the cantus firmus structures that were pointed out by Strunk.

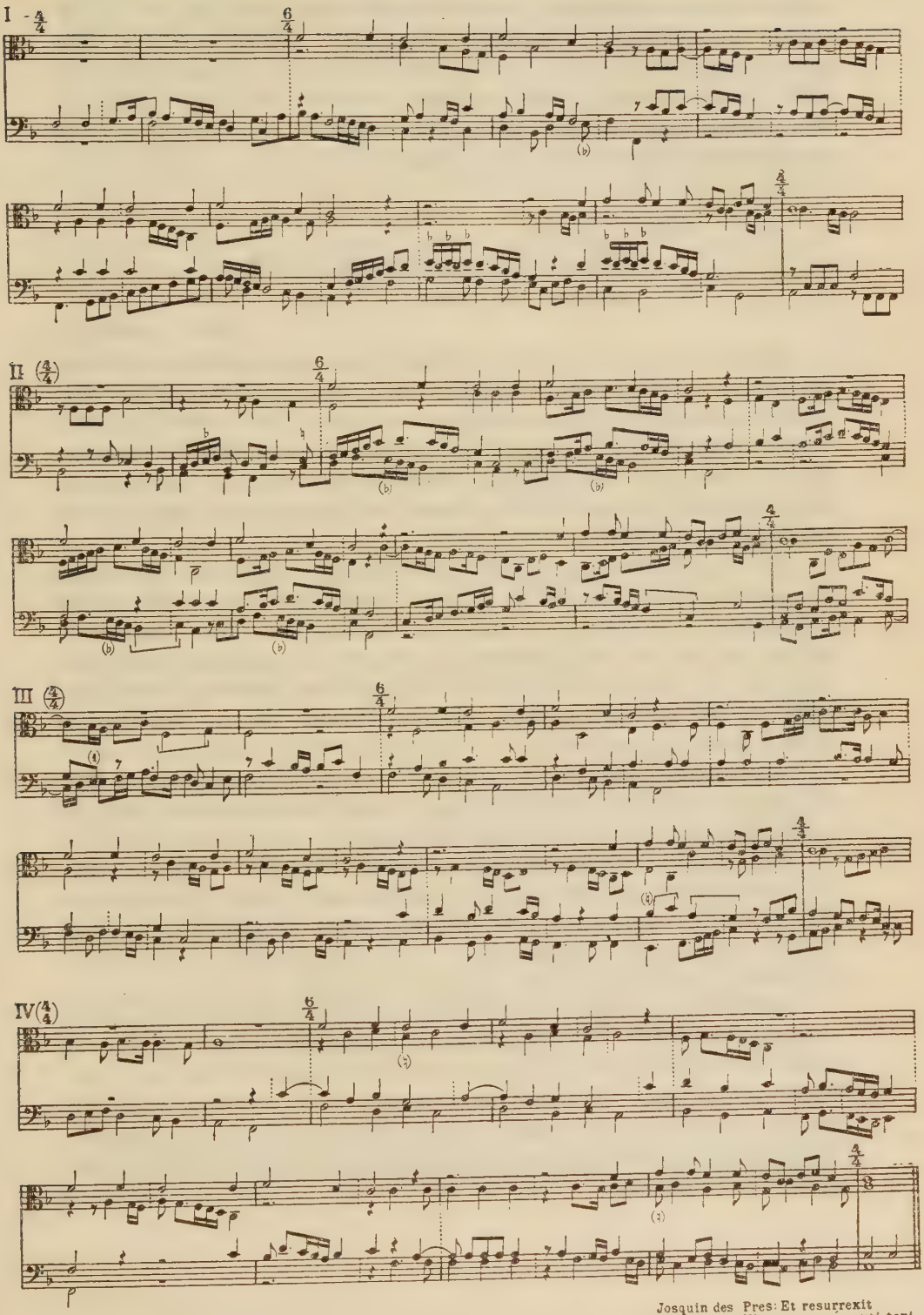
Without going deeper, for the present, into these fathomless waters, here two characteristic examples will be presented of what this writer considers construction in Gothic form. These examples were not selected with the intention of stretching a point. Their peculiar form was noticed while they were being studied for other purposes. Hence this « marginal note ». The forms we are going to examine differ from the « isorhythmic » four-line-stanza form of Okeghem's *Agnus*, which is determined by the canonic construction. The difference, howerer, is of degree rather than of principle. Especially in the first case, the « Et resurrexit » of Josquin's *Missa L'homme armé sexti toni*, the basic idea of repeating a metrical pattern is the same, and also the composition consists of four lines. Here, however, the repetition is not brought about by canon; rather, it is the consequence of repeating four times a cantus firmus segment together with the rests preceding its first rendering. It is, thus, of the kind observed by Strunk.

The composition is easily accessible in new edition. It is recommended that the reader compare Smijers' correct critical edition with the following transcription. In the latter note-values are reduced 1:4 and the barring is in units of either 4 or 6 quarter-notes (semibreves of the original); thus, one or two such units constitute a larger part of musical construction[5].

[4] *JAMS* 2, (1948), 107-110.

[5] A word or two about the use of barlines in these transcriptions may be desirable. (1) Solid bars across all staves designate the cadence of a phrase or metric unit (half-line, or less). They are placed, in the case of a masculine cadence, just ahead of the final chord; in feminine cadences the necessary corrections have to be made. (2) Solid bars across the several staves and connected by dotted bars indicate « Grosstakte », usually double measures, out of which the metric units are formed. (3) Solid bars across the several staves separate the measures. (4) Dotted bars across a stave designate (a) syncopation within a « Grosstakt » or (b) subdivisions of a compound measure. The time-signatures simply count the number of beats (quarter-notes), and should not be considered expressive of any accent-pattern.

(Ex. 1).



Josquin des Pres: Et resurrexit
Missa super l'homme armé sexti toni

(1) Ed. Smijers: f

The composition consists, in accordance with the fourfold repetition of the cantus firmus segment, of four equally constructed lines, and it resembles in this respect Okeghem's composition referred to above. But the inner organization of the lines is totally different. The lines are quieter, with a greater tendency to being « square », and they are more symmetrical. The passages employing the cantus firmus alternate with introductory and interlude-like passages in a witty pattern:

plus 8 12 6 12 12 4 plus
(c.f.:) ...6/4 6/4 .....6/4 6/4.....6/4
4/4 4/4 6/4 6/4 4/4

The metrically correct « anacrusis » of $2 \times 4/4$ is completed, in the last measure, to a $3 \times 4/4 = 12/4$ unit, contrasting with the $4 \times 3/4 = 2 \times 6 = = 12/4$ construction of the cantus firmus sections. The contraction of the first interlude (meas. 5) to a single 6/4 measure is a remarkably fine feature. The second interlude (meas. 8), that shows twice pre-imitation, and contains an anacrusis of the cantus firmus, forms with the following cantus firmus section (meas. 9) another $2 \times 6/4$ unit.

The metrical lines are, of course, not separated sharply from each other. The 4/4 end of the one with the $2 \times 4/4$ beginning of the next line forms a continuous 12/4 unit that is especially tightly woven. Short imitations, starting in line III, with anacrusis in the last 6/4 measure, in the two other cases at the first beat of the first 4/4 (closing measure of the lines), emphasize this continuity. Such imitative textures also cut through the metrical pattern within the lines. Thus, right at the beginning, the motiv of 8 quarter-notes imitated at a distance of 4 quarter-notes reaches into the first cantus firmus measure of 6/4. The first interlude starts with an up beat of 3 eighth-notes, and within the 6/4 measure this motiv is repeated.

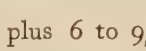
Thus Josquin does not refrain from repetitions within a section. The two cantus firmus phrases of $2 \times 6/4$ of the second line are of identical structure, with « Stimmtausch » of the inner voices. Similarities also occur between the corresponding measures of the several lines, e. g. in meas. 8 of lines I and II, or in meas. 9 of the same lines.

Here, meas. 8 and 9 (second interlude and last cantus firmus measure) are closely connected. In line I the bass of the interlude anticipates the cantus firmus motiv; the middle parts are repeated and result in the same continuous counterpoint. In line II the repetition of the middle parts is free and the cantus firmus is anticipated only in its second half by the corresponding place in the tenor. Consequently the tenor had to be changed in the cantus firmus measure.

In this Mass-section by Josquin we find a fluid contrapuntal texture built around a repeated cantus firmus phrase, organized according to strict ideas of metrical form. Neither the fluency, nor the formal, metrical balance suffers or is impeded by this dual aspect. The form, the metrical plan, is not a « natural » one: it does not originate from the dance, from the motor impulse of the body. It is a freely chosen order, a creative form-idea. These metrical lines succeed each other like windows in the wall of a Gothic church, according to a measured, rational plan. Yet the rigid frame of form is enlivened by a thousand details of lace-work and ornamentation, playing with contrast and variation freely and fancifully. The basic identity of feeling for order in the whole and for fanciful detail is found in the frozen music of late Gothic cathedrals and in the sounding architecture of Josquin's Mass-section alike.

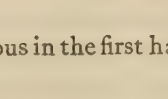
The problem of such coordination of elements, such relationship of general order and ornamental detail finds an endless variety of solutions both in Gothic architecture and in Gothic music. Okeghem's « Agnus » and Josquin's « Et resurrexit » are not isolated cases. On the contrary, they seem to be typical examples, although it might be difficult or impossible to find an exact parallel to either of them. Yet some kind of basic plan, some metrical organization of lines, is to be found in every composition. Whether this organization shows any regularity, and, if so, of what kind, may form one of the most important criteria of stylistic criticism.

In order to give an idea of the great variety of such form organisms, a form of quite different kind is presented here: Dufay's Jacobus-Postcommunio (Vos) qui secuti estis, from BL 119, recently published by Besseler [6] as the oldest example of choral arrangment in fauxbourdon, written shortly before 1430. With this composition, too, a re-barring according to the inherent metrical changes seems to be advisable for our purpose (Ex. 2).

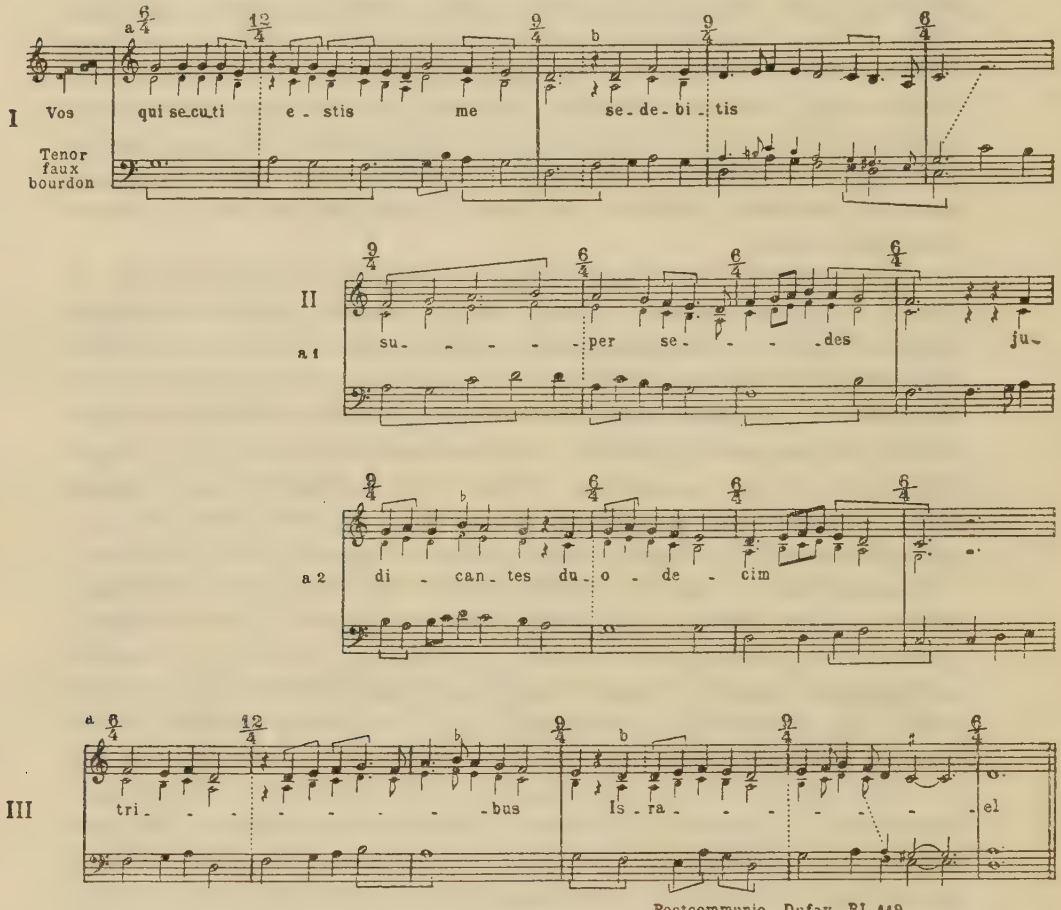
The metrical scheme again consists of 12 quarter-note « measures », two of which constitute a half–line. The lines begin with 6/4 anacrusis and end, after a full measure, with 6/4. Yet this pattern of 6/12/6 plus 6/12/6 is modified by contractions and extensions. In lines I and III the juncture of the two half-lines is contracted from 6 plus 6 to 9/4:  while the penultimate measure of these lines is also shortened 9/4, although here the exact place of contraction cannot be pointed out. Strangely, the last line seems to suggest extension rather than contraction.

The middle line II makes up for the « deficiency » of the outer lines

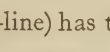
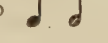
[6] *Die Musikforschung* 1, 1948, 106-112, esp. 109. The entire Mass has just been published as the fourth volume of Dufay's *Op. om.*, (*Corpus Mensurabilis Musicae* of the American Institute of Musicology).

by stretching the « upbeat » of each half-line to 9/4. This becomes quite obvious in the first half-line:  instead of

(Ex. 2).



Postcommunio, Dufay, BL, 119
cf. Besseler, Die Musikforschung I (1948), 199.

The composition shows thorough planning. Every cadence (the end of every half-line) has the same rhythmic shape  modified in the last line to  whereby the cadence is evaded, and to with traditional stretching of the penultima. The first and last lines close with the discant-tenor clausula, in which the discant reaches the tonic from the leading tone (or « Landino »-sixth) while the

tenor descends to it diatonically. In all other cadences the diatonically descending motiv is in the discant, while the tenor leaps downwards by a fourth.

With its finely balanced deviations from a numerically even « norm », the composition is a marvel of Gothic form. Its contractions and extensions do not express a textual content and are not built up to climaxes. They are neither humanistic nor romantic. Rather, they are of an abstract nature: self-explanatory, sovereign, unique, an act of artistry. The differing filled-in material notwithstanding, the lines I and III are of identical metrical build. Some correspondences, however, do exist. Thus the quarter rest occurs in both lines at the beginning of meas. 2, and the second half-lines are, in spite of the rhythmic dislocations of the last half-line, in *ouvert-clos* relationship. The middle line II consists of two equal half-lines. Again there are many connections between the two half-lines, e. g. the respective beginnings of the tenor, a-g-c and b-a-..-d, or the whole second half of each half-line, whereby II, 2 is a free repetition starting on the lower third and continuing on the lower fourth.

Dufay's form in comparison to Okeghem's or Josquin's appears less calculated, less rigid in its order. It is more airy and simpler. Its « ornaments » make the form, and constitute the « order », instead of filling it out or being applied to it. Form and matter, order and ornaments are one. While — sacrilegious as it may seem — the mental experiment of substituting a quite different detail of lace-work for any of Josquin's seems feasible, no radical substitutions could be made in Dufay's work. It remains to be seen whether this difference is due to the size of the composition or whether it constitutes a stylistic trait of the respective masters and of their periods: Dufay, 1430, or Josquin, 1490. This writer believes that the latter is the case.

While these examples may be taken for what they seem to be worth, the writer, for one, thinks that they vindicate a novel kind of transcribing that will show the compositions *in vivo* rather than *in vitro*. Should his interpretations prove to be right, we shall be able henceforth to recognize a factor that gives us a *tertium comparationis* in criticism of style and a corrective to the much overestimated « linearity » of contrapuntal « forms ». We shall also be able to recognize a potent and up to now badly neglected component of style: metrical organization and form.

The University of Chicago.

THE MIXTURE PRINCIPLE IN THE MEDIAEVAL ORGAN

An Early Evidence

H. AVENARY - LOEWENSTEIN

The origin of the mixed voices belongs to the dark chapters in the history of the organ. Their introduction is generally placed in the 12th century. This date is mainly deduced from the fact that the mixtures are not mentioned in the numerous treatises on the mensuration of organ-pipes which are handed down from earlier times.

The reserved attitude of the theorists, however, does not exclude the possibility that mixed voices were already in practical use. One must bear in mind that mediaeval theory of music was governed by a speculative, unreal systematism, and that the gaping incongruity between *scientia* and *usus* could only be repaired by the efforts of decades, if not centuries. Early polyphony (*discantus*), for instance, had been such a hard problem for the systematists; after *Musica Enchiriadis* of the 9th century, 150 years had to pass before theorists took due note of that which was new there. Similarly the mixture-stop of the organ, as a sort of mechanically produced polyphony (particulars on this conception below), might have been an innovation of musical practice which the traditional system had not yet been able to assimilate.

In the following discussion we shall deal with an unknown treatise — probably the oldest one that describes the mixtures. Moreover, this treatise throws some light upon the origin of the mixed voices — one of the essential characteristics of the organ's sound.

* * *

The Bibliothèque Nationale of Paris keeps a Hebrew manuscript which probably comes from Southern France and dates, according to the catalogue[1], from the XVth century. It contains the following items:

a) a Hebrew translation of a musical treatise by the Arab author Abu'l-Salt (1067-1151);

[1] M. Zotenberg, *Catalogues des manuscripts Hébreux et Samaritans de la Bibliothèque impériale*, Paris, 1866 No. 1037,.

b) a treatise translated from Latin, and reflecting the theory of music in the first half of the 12th century;

c) collected notes in Hebrew, quoting Marchettus of Padua (*c.* 1300).

These treatises, so divergent in time and locality of origin, were taken from previous collective manuscripts and written by a careful, but ignorant writer [2].

The middle part *b*) was translated by an unidentified Y'hudah ben Yitz*h*aq and consists, as stated in its head line, of five chapters. There is, however, an additional sixth chapter called « Gate on the construction of musical instruments », wherein the mensuration of the monochord, of organ-pipes, and little chimes (cymbala) is treated. This subject is a traditional supplement of mediaeval treatises on musical theory.

The mensuration of the organ-pipes is described according to two different methods, an « old » and a « new arrangement » [3]. The latter contains the regulation on the mixtures; for elucidation the short text follows here:

THE OLD ARRANGEMENT for the construction of the tympan-instrument which is called *orgela* [4].

Flatten tin sheets, and the breadth of every sheet shall be a fifth of its length. Make the first as long as you like. Make the second by an eighth shorter than it.... (etc.).

A NEW ARRANGEMENT. Make the second by an eighth shorter than the first. The third: reduce the second by half a quarter. The fourth: diminish the first by a quarter. The fifth: (reduce) the second by the fourth part. The sixth: reduce the third by a quarter. The seventh: (reduce) the fourth by a quarter. The eighth: reduce the third by the third part. — And these eight tympans stand upright, each on its key, and their front turns towards the musician. They are called « Fathers » (i. e. « fundamentals »).

Behind each of them set up (a tympan) in the height of the fifth tympan after it. And who has no fifth, sets up behind it (a tympan) smaller in proportions, and also (smaller than) the others. Behind these set up (additional tympans), each of them being half as large as its fundamental with regard to size, length, and breadth. And according to the size of the

[2] For particulars on the composition of this manuscri.pt see: H. Loewenstein « The art of music in Jewish sources (X-XVII cent) », *Kiryath Sepher*, Vol. XXI, p. 187-188. Jerusalem, 1944. (Hebrew).

[3] Aribo Scholasticus quotes also an « old » and a « new » mensuration. Cf. GERBERT, *Scriptores*, vol. II, p. 222.

[4] In the manuscript is written מורגלא instead of אורגלא (very resembling in fluent Hebrew writing). On the unusual form « orgela » see below. — Cf. Fig. 1, last word of line 3.

instrument, put on every tympanist many tympans, fourths, fifths, and eighths.

First of all, some notes on the terminology must be inserted here. The text puts as a synonym of organ-pipes the Biblical word *thupim*, the plural of *thof* = tympan (drum) [5]. This word corresponds in meaning and onomatopoetic root to the Greek-Latin *tympanum*. In mediaeval Latin *tympanum* is often used in the meaning of « bagpipe » [6]. In our text, the elements of organ construction (i. e. pipes and bellow) are considerd to be in principle the same as the popular bagpipe. The Hebrew translator must have found the term *tympanum* already in the underlying Latin text; being unusual in connection with the organ, it was explained there by the gloss *orgela*. We shall have to revert in detail to the form *orgela* instead of the Middle Latin *organum* or *organa* when treating the dating problem.

The prescribed proportion of organ-pipes gives a major scale reaching from *c* to *b* sharp, and containing also a minor seventh. Curt Sachs has recently pointed out [7] that the calculation of the whole tone in the ratio 8: 7 (as in our Ms), instead of the usual 9: 8, is a peculiir tuning principle. It results in larger whole tones and considerably smaller semitones. This strange mensuration is known from a Latin Ms of the 11th century, and is now confirmed by our text.

The second paragraph of the « New Arrangement » deals with the mixtures. They consist, as to our source, of fifths and octaves. If there is no fifth, the mixture note must in any case be higher than the highest note of the fundamental scale. For large organs a triple or manifold mixture is provided, where the fourths join the fifths and octaves. It is worth noting that, contrary to the Renaissance and Baroque organ, the fourth, instead of the third, appears in the mixture of sounds.

The importance of these informations for the history of the organ depends on the problem of dating. It can only be indirectly solved. We must answer this question regarding the treatise itself separately from that regarding the supplemental chapter on the instruments; for the headline of the treatise announces only five chapters. The instrumental instructions form a sixth chapter and must be an appendix, not foreseen in the original conception.

[5] Curt Sachs, *Real-Lexikon der Musikinstrumente*, p. 388. Berlin, 1913.

[6] E. Buhle, *Die musikalischen Instrumente in den Miniaturen des frühen Mittelalters*, Vol. I, p. 47. Leipzig, 1903.

[7] Curt Sachs, « A strange medieval scale ». *Journal of the American Musicological Society*, Vol. II, p. 169-170.

The theory of music in the main treatise corresponds to the state of this doctrine in the first half of the 12th century [8]. But the chapter on the instruments bears the mark of a former time, for it contains two glosses in the Old-High-German language:

1) the above mentioned *orgela* (or *orgla*) with its transformation of n to l is the German form of the Latin-Romanic *organa*;

2) among the instructions on the rectification of the bell tune appears the passage: « ....with a file which is called viola ». A late Latin form of this remarkable word *viola* is *phiala* [9]; this fact indicates the solution: « fihala » is Old-High-German and means « file ».

From a philologic point of view, the two words *orgela* and *fihala* with their full-sounding, still unweakened « a » of the middle and end syllables must belong to the 11th century. Even if these glosses were written in the district of the slowest development of language, i.e. in the Alamannic territory, they cannot be dated after 1100. By the way, it may be pointed out here that *tympanum* is translated in Old-High-German glosses with *balcswegala* = bagpipe [10].

The supplemental chapter on musical instruments must therefore be dated 50 to 100 years earlier than the treatise itself. It represents *an evidence of the mixtures in the 11th century*, and can probably be dated back as far as Notker Labeo (d. 1022) and his Old-Alamannic organ treatise [11].

* * *

Although our source is still an isolated one, it nevertheless induces one to discuss the mixture problem in connection with a cognate phenomenon of the early Middle Ages: the Organum of the Fourth and the Fifth.

H. G. Farmer's researches on the organ in the Hellenistic and Islamic culture [12] have clearly shown that our « Queen of the Instruments » is also

[8] Without anticipating a special analysis I must point out the following: The treatise explains the 19-tone system and the 7 kinds of harmony of Guido d'Arezzo. It furthermore explains the doctrine of mutation (appearing for the first time in Cotto's works), and gives a sketch of the Guidonian Hand (see Fig. 2). — On the other side, our treatise does not yet know the Semibreve and the 20th note of the system (the ee). Peculiar are its four quart-species (including the tritone), and other details.

[9] Curt Sachs, *Op. cit.*, p. 296.

[10] E. G. Graff, *Althochdeutscher Sprachschatz*, Vol. VI, p. 858. Berlin, 1842.

[11] J. Schmidt-Görg, « Ein althochdeutscher Traktat über die Mensur der Orgelpfeifen ». *Kirchenmusikalisches Jahrbuch*, Vol. XXVII, p. 58 seq., Regensburg, 1932.

related to the musical automaton and mechanical-musical play work — a relation which continues in the crowing passion-cock and the wing-fanning angels of the Baroque organ, in the flute-clock favoured by Haydn, up to the barrel-organ and the « orchestrion » of our days. The Mediaeval organ was heir and testator of a great mechanical tradition. So we can set forth the hypothesis that the mixture was originally invented as a « *vox organalis* » *to the fundamental melody, obtained by mechanical means.* The production of characteristic tone-colours by the mixture principle (the empirical anticipation of Helmholtz's doctrine) is a later, secondary evolution.

The character of mediaeval instrumentation allows the conclusion that the melting of the instrumental voices did not meet the musical feeling of that epoch. Sound-colour was not essential. The most heterogenous instruments could replace each other, or replace even the human voice. In the Mediaeval organ every mixture note sounded as strong as the fundamental tone. So we gain the impression that the Mediaeval listener did not like to « hear together » but to « hear asunder ». When listening to the organ, he heard an obstinate fifth-octave or fourth-octave harmony; he perceived a strict parallel-organum [13].

The organ-builder possessed the strongest technical qualifications among the instrument makers of ancient times. His technical abilities sufficed, as reported by Oriental and Western sources, to give his instrument even the shape of a tree with singing birds. So he created with the mixtures an automatic contrivance which fixed the organal choir of the discantus singers into his instrument.

Tel-Aviv.

[12] H. G. Farmer, *The Organ of the Ancients,* London, 1931.

[13] The equality of the terms organum = organ, and organum = singing in parallel harmonies has often been pointed out.

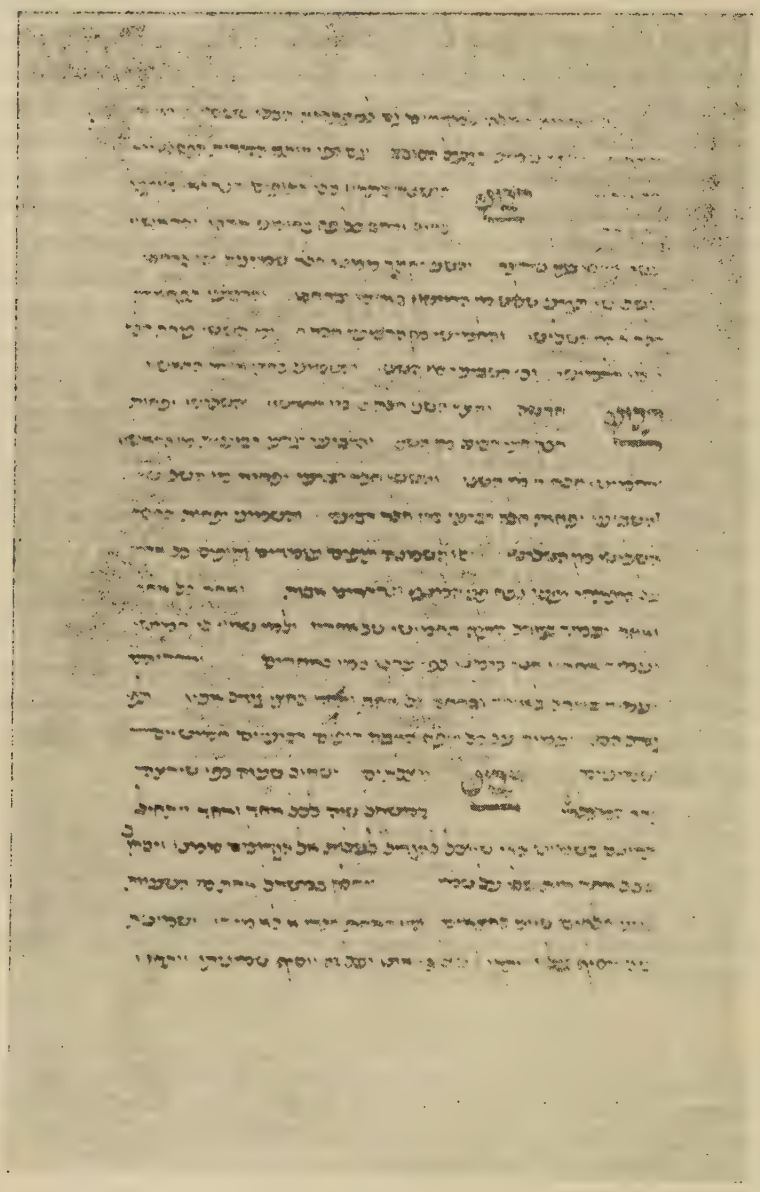


FIG. 1. — Ms Paris, Bibl. nat. Fonds Hébreu 1037, fol. 27r: Two paragraphs on the mensuration of organ pipes, and one on the cymbala.

FIG. 2. — Ms Paris, Bibl. nat. Fonds Hébreu 1037, fol. 23r: The Guidonian Hand. (The marginal notes in Italian are later additions).

DOWLAND'S LACHRYMAE TUNE

Otto Heinrich Mies

« Lachrymae » is one of the most popular tunes in Elizabethan music. Many composers of the time used it for songs, string compositions or lute pieces. At that time « wandering tunes » used by many composers were numerous. « La Folia », which became of importance in England, and later on « Romanesca » are well-known instances. But none of these wandering tunes was so closely connected with the name of one composer as « Lachrymae ». « Dowland's Lachrymae » had become a proverbial saying and it is synonymous with « sorrow » or « melancholy ». Philip Massinger wrote in *The Maid of Honour*, 1621:

> « Or with the hilts, thunder about your ears
> such music as will make your worships dance
> to the doleful tune of Lachrymae ».

Or Thomas Middleton in *No Wit, no Help like a Woman's*, 1613:

> « Now thou playest Dowland's Lachrymae to thy master ».

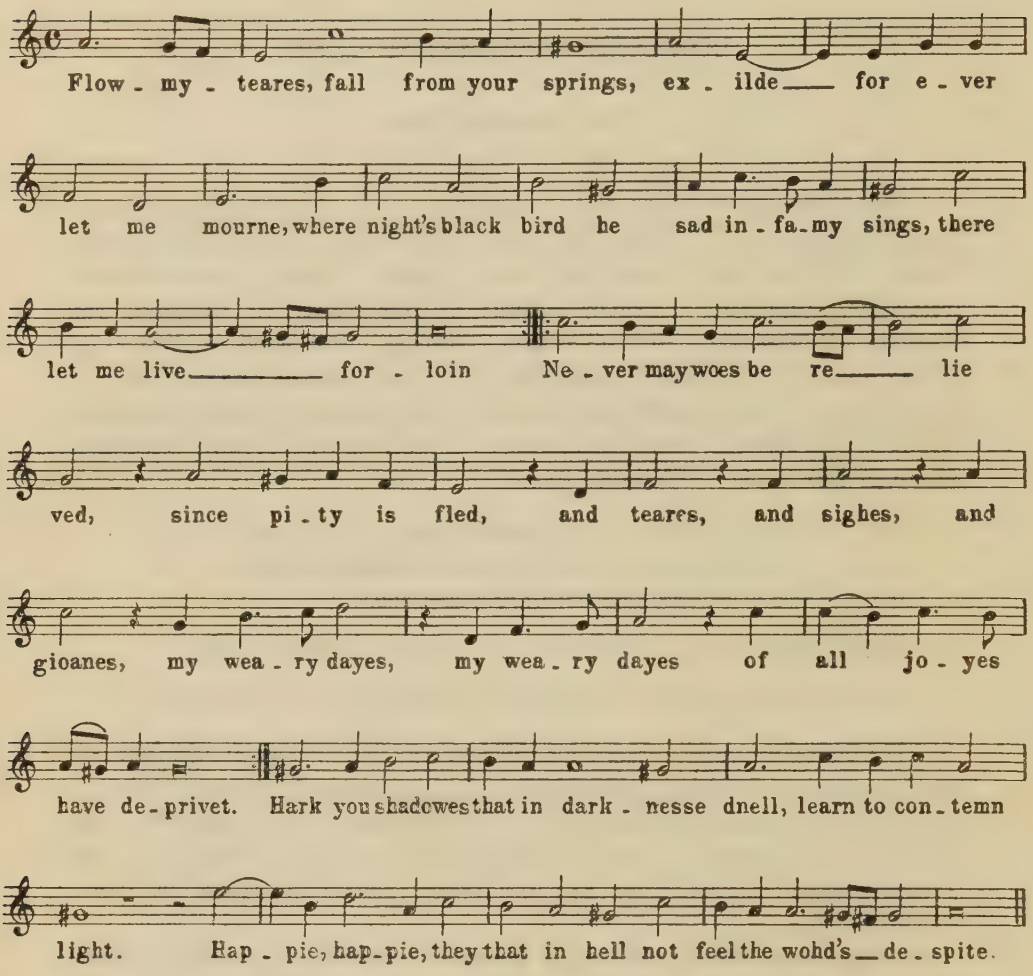
By enquiries to libraries and scholars the writer has found not less than 43 pieces of music of the time which imitate the Lachrymae tune or are at least strongly influenced by it. The greater part of them bear the name of Lachrymae. On a comparison of these pieces, Dowland's song *Flow my teares* [1] proves to be the Lachrymae tune in its purest and clearest form. (Ex. 1)

At the same time this tune is perhaps one of the most characteristic instances of Dowland's songs from a musical point of view. Its form is that of a pavan, as we find it in many of Dowland's songs: three parts, of which the measure can be divided into four. The beginning of *Flow my teares* stands out like a heading to the rest of the song. This, too, may be noticed in many of Dowland's songs. (Ex. 2)

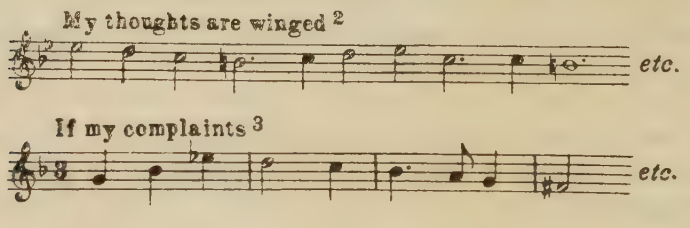
In *Flow my teares* we also find the typical expression of melancholy that is one of the characteristics of Dowland's music. We may safely conclude that the Lachrymae tune was composed by John Dowland. His contemporaries, too, were of that opinion. This is shown by the

[1] *Second Booke of Songes*, No. 2.

Ex. 1


Flow - my - teares, fall from your springs, ex - ilde for e - ver
let me mourne, where night's black bird he sad in - fa - my sings, there
let me live for - loin Ne - ver may woes be re lie
ved, since pi - ty is fled, and teares, and sighes, and
gioanes, my wea - ry dayes, my wea - ry dayes of all jo - yes
have de - privet. Hark you shadowes that in dark - nesse dnell, learn to con - temn
light. Hap - pie, hap - pie, they that in hell not feel the wohd's de - spite.

Ex. 2



[2] First Booke of Songes, No, 3.
[3] First Booke of Songes, No. 4.

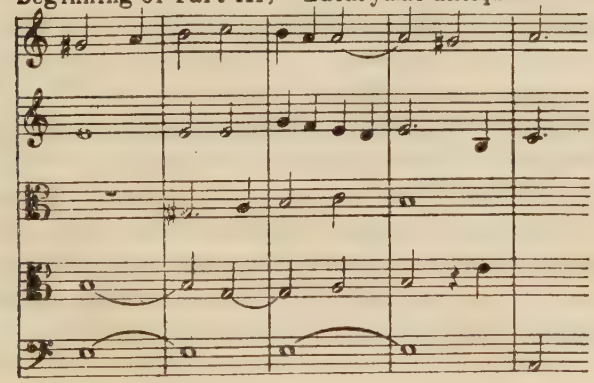
passages quoted above and by many other passages from literature. Dowland himself claimed to be the composer of the song. In 1595 he entered his name in the *album amicorum* of Johann Cellarius in Nuremberg [4]. Beneath a little canon he wrote: « Io. Dolande de Lachrymae his own hande ». By the expression « de Lachrymae » he could not mean anything else than: The composer of the Lachrymae tune. By this entry it seems that even in Germany the Lachrymae tune was known at that time.

The earliest date we have of the Lachrymae tune appeared with the lute fantasia « Lachrymae » in Barley's *New Booke of Tabliture*, 1596. Dowland's song appeared only in 1600. The Ballet Ms[5] contains a Lachrymae piece for the lute carrying Dowland's name. This Ms was dated by Dr. Grattan Flood to 1594. Dowland's fantasia in Barley's book appeared in 1596 and his song in the *Second Booke of Songes* only in 1600. One might therefore suppose that the Lachrymae piece of the Ballet Ms, as the earliest, was the original one, and that Dowland, whose first fantasia appeared in 1596, was only one of the main adaptors. But the Director of the Dublin Library and other scholars have assured me that there is no clue for such a precise dating of the Ballet Ms. It may be assumed, however, that the song *Flow my teares*, or a lute fantasia upon it, was known before that date by Dowland's personal recital. He journeyed in France, Germany and Italy between 1580 and 1596 and was lutenist to the king of Denmark from 1598 till 1606. So he himself spread his music all over Europe. Therefore he might have taken knowledge of his Lachrymae tune for granted before the lute fantasia appeared in print.

The Lachrymae tune is the main issue of Dowland's whole work. It

Ex. 3

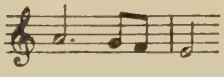
Beginning of Part III, Lachrymae antiquae



[4] Brit. Museum, Add. 27579.
[5] Dublin, Archbishop March's Library.

is not only the melody of one of his most significant songs; his seven great Lachrymae pavans are thematically based upon that melody. The pavans appeared in 1604 in Dowland's *Lachrymae or seaven teares figured in seaven passionate pavans*. Their common tonality is A minor. Part I and Part III close in the tonic, the middle part closes in the dominant. The first one of the seven pavans, called « Lachrymae antiquae » brings the melody of the song *Flow my teares* in the *cantus* without any alterations. The bass voice and the lute, too, keep close to the corresponding voices of the song. The setting, for five parts, is of extreme density so that the great strength of expression makes good for the missing words. (Ex. 3).

In the following pavans the importance of the *cantus* as a bearer of the melody more and more decreases, while the liveliness of the middle parts increases. The *cantus* of the second pavan, « Lachrymae antiquae novae », only occasionally shows parts of the original tunes. In the following pieces, « Lachrymae gementes », « Lachrymae tristes », « Lachrymae coactae », « Lachrymae amantis », and « Lachrymae verae » the purely melodic suggestions of the tune become more and more seldom. The only links between the pieces are their form, consisting of three parts, the similarity of a few melodic and harmonic phrases, and above all, the melancholic expression in all of them. The only real imitation which occurs in every piece is the beginning of the Lachrymae tune.

Ex. 4 

By the suggestions of the Lachrymae tune here mentioned and by many more, the seven Lachrymae pavans with their characteristic headings are a solid unit thematically, and also from the point of view of expression. The expressiveness of this music becomes more important than its use for dancing. This fact is shown also by Dowland's characterization of the pieces as « passionate pavans » in the title of his Lachrymae book.

Among the numerous Lachrymae compositions not composed by Dowland himself, there are only few compositions for strings. There is a pavan and Galliard by William Brade [6], a pavan by Anthony Holborn, a pavan of two parts [7] by Johann Schop, a pupil of Brade, and a pavan of four parts by Leonhard Lechner [8] of which only the tenor part exists. In two passages the part shows the motive of Lachrymae, thus proving that this setting, too, originates in Dowland's Lachrymae.

[6] Füllsack, ausserlesener Paduanen I. Theil, Hamburg 1607.
[7] Matthysz, 'T Uitnemend Kabinet, Amsterdam 1646.
[8] Berlin, Pr. Staatsbibliothek, Mus. ms. 40377.

William Byrd, Giles Farnaby and Thomas Morley have composed virginal pieces based on the Lachrymae tune. They are contained in the Fitzwilliam Virginal Book, those by Byrd and Farnaby under the name of « Lachrymae », those by Morley without this designation (Nos. CLIII and CLIV).

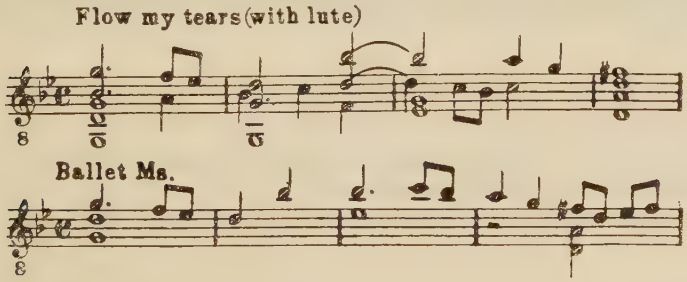
The greatest part of the adaptations of Lachrymae not by Dowland consists of lute pieces. The writer has counted 22 pieces by various composers, of which some are close imitations of others. The lute fantasias have a richer arrangement of the parts than the string pavans. The difference is as follows:

String pavan	Lute fantasia
Part I	Part I
Repetition	Repetition
	Variation of Part I
	Repetition of Variation

Thus in the lute fantasies each of the three parts of the piece is extended.

The following instances of three lute pieces show the differing treatment of the original tune by different adaptors. Dowland's song *Flow my teares* and its lute accompaniment is the starting point of all the Lachrymae compositions and is therefore added for comparison after transposing it into G minor, the key of the Elizabethan lute. The other three pieces are the Lachrymae fantasias of the Ballet Ms mentioned before, that of the *Thesaurus Harmonicus* by Besardus[9], and that of a manuscript Tablature

Ex. 5



book by Schele[10], who, however, seems to have had Van den Hove's *Delitiae Musicae*[11] as a model. The Lachrymae fantasia in that book is much the same as Schele's.

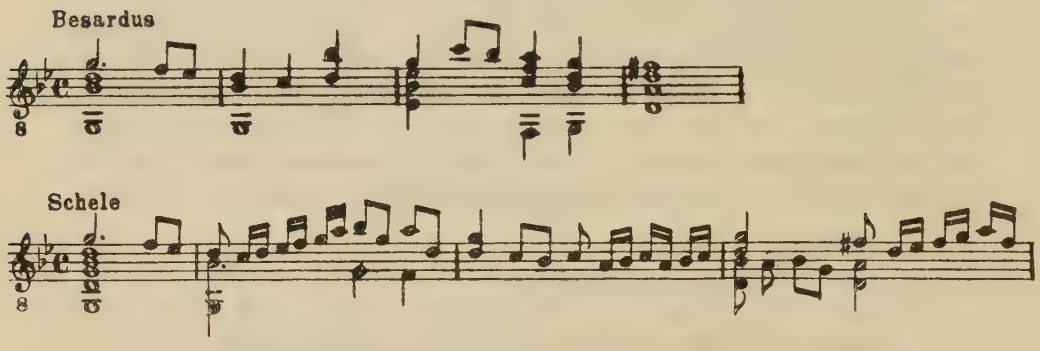
The writer of the Ballet Ms presents this melody in its simplest form, without ornamentations, and gives only the bass notes of the harmony.

[9] Cologne, 1603.
[10] Hamburg 1619, MS ND VI 3238.
[11] Leyden 1612.

Besardus gives quite full chords. Schele too writes few chords, but he breaks the melody, and occasionally also the harmony, into runs and leaps of semiquavers. It is obvious that those adapting the tune depended upon Dowland's original piece, which must have had a wide renown in Europe.

Charles Burney writes on Dowland's music as follows: « After having been at the pains of scoring several of Dowland's compositions, I have been equally disappointed and astonished at his scanty abilities in counterpoint, and the great reputation he acquired with his contemporaries [12] ». Burney's disappointment is quite natural as he looked for contrapuntal skill, which does not entirely lack in Dowland's works but which is of minor importance. The reason for the great popularity of Dowland's music and especially of his Lachrymae tune resides not in his contrapuntal art but in the power of expressiveness inherent in his music and which does not seem to exist to the same extent in the music of any English composer of the time.

Ex. 6



[12] Ch. Burney, *A General History of Music from the Earliest Ages to the Present Period*, London 1789.

L'ETABLISSEMENT D'UN CATALOGUE PAR INCIPIT MUSICAUX

NANIE BRIDGMAN

Alors que toutes les grandes bibliothèques musicales, aussi bien américaines qu'européennes, ont mis au point un système de catalogage qui semble répondre à tous les besoins, le seul catalogue dont personne ne se soit préoccupé jusqu'à présent est celui par incipit musicaux, et, aussi paradoxal que cela puisse paraître, aucune bibliothèque musicale à ma connaissance ne possède un tel catalogue. Je sais bien que même parmi les spécialistes beaucoup pensent qu'un catalogue de ce genre ne présente guère d'utilité. Mais tout bibliothécaire auquel répugne l'idée de laisser dormir dans les tiroirs à peu près inutilisables des anonymes des pièces copiées ou publiées sans nom d'auteur, se donne la peine de procéder à des identifications. Or celles-ci sont très longues: si la pièce n'a pas de titre, on ne peut compter que sur l'heureux hasard qui fera jaillir de la mémoire le nom de l'auteur. Si elle a un titre, on peut la retrouver au fichier des incipit littéraires; mais il faudra toujours procéder ensuite à une vérification sur l'ouvrage même, car un même titre peut désigner des compositions différentes: il suffira de rappeler les nombreuses versions de textes tels que: *Fors seulement*, *Malheur me bat* et tant d'autres. Il semble donc indispensable d'établir un catalogue qui permette ou abrège les identifications de ce genre.

Pour l'établissement d'un tel catalogue, ce qu'il faut isoler en premierlieu c'est la musique folklorique à laquelle on ne saurait appliquer les mêmes principes de classement qu'à la musique dite savante. En effet, les bibliothèques musicales ne possèdent le plus souvent en guise de folklore que des recueils de qualité scientifique douteuse et c'est aux bibliothèques d'ethnographie — qui possèdent, elles, les documents exacts — que revient le devoir d'établir un catalogue de ce genre. Sur ce sujet, dans les *Sammelbände der Internationalen Musikgesellschaft*[1], le viennois Oswald Koller d'abord, puis Ilmari Krohn de Helsingfors ont répondu par deux articles fort intéressants à la question qui avait été mise au concours par Scheurleer de La Haye dans la *Zeitschrift der Internationalen Musikgesellschaft*[2]: « Welche ist die beste

[1] 4ème année, p. I et p. 643.
[2] 1ère année, p. 219.

Methode, um Volks- und volksmässige Lieder nach ihrer melodischen (nicht textlichen) Beschaffenheit lexikalisch zu ordnen ? » Plus récemment, Béla Bartók dans la préface à son ouvrage intitulé: *Hungarian folk music*[3], expose à son tour sa méthode de classement qui est dérivée d'ailleurs de celle du Professeur Krohn. C'est aux spécialistes qu'il appartient de juger la valeur de ces différentes méthodes.

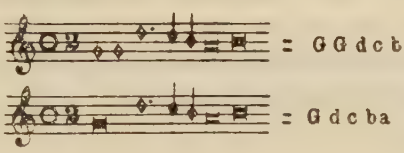
Il faut rappeler que le premier essai d'un classement des mélodies d'après les seuls principes musicaux a été fait par Johannes Zahn dans son gros recueil: *Die Melodien des evangelischen Kirchenliedes*, qui est classé d'après la métrique du vers. Ce système est très pratique, mais il est bien évident qu'il ne peut s'appliquer qu'à la musique vocale et dans cette musique même à celle qui porte une syllabe par note comme le choral protestant.

La tentative la plus récente d'un classement par incipit musicaux a été faite par Harold Barlow et Sam Morgenstern dans leur *Dictionary of Musical Themes*, publié à New York en 1948. Ce dictionnaire veut être pour la musique ce que les *Familiar Quotations* sont pour la littérature. C'est assez dire que ses buts sont plus pratiques que scientifiques. Le classement adopté est un index alphabétique des lettres correspondant aux notes, tous les thèmes étant ramenés à une tonalité unique de do majeur ou mineur. Seul le volume concernant la musique instrumentale a paru et comme une critique très documentée de cet ouvrage a déjà été faite[1], il est inutile d'y revenir.

Dès 1942, la Bibliothèque nationale de Paris a essayé d'ajouter à ses catalogues déjà nombreux un catalogue par incipit musicaux. Il ne s'agissait pas de dresser un index thématique et de donner une idée exacte des thèmes avec leur rythme et leur tonalité, mais de représenter un thème par des symboles faciles à classer et faciles à retrouver. Le but était d'ordonner en lexique toute la musique jusqu'à 1800, aussi bien vocale qu'instrumentale et de constituer un fichier par incipit musicaux comme on en avait établi un par incipit littéraires. Ce travail a été commencé sur les bases suivantes: l'incipit musical est d'abord noté intégralement avec toutes ses parties sur une carte spéciale avec portées imprimées. Ensuite il est classé suivant une méthode qui suit de très près celle établie par Koller dans l'article des *Sammelbände* cité plus haut. Cet éditeur des Codices de Trente se devait de parler de la musique ancienne avant d'aborder la question du folklore. Le classement est basé sur le seul caractère mélodique. Chaque incipit est transcrit en lettres suivant le système guidonien, mais sans se servir de *h* car on ne tient pas compte des accidents. Puis on classe ces lettres suivant l'ordre alphabétique en partant de la note la plus grave et on range ainsi les thèmes dans un premier groupe d'après la hauteur de leur première note, puis de

[3] London, 1931.
[1] *Notes*, June 1948, p. 375.

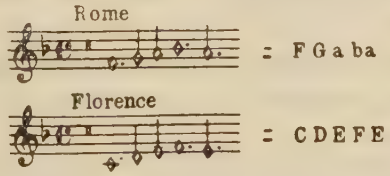
leur deuxième, troisième et ainsi jusqu'à la cinquième car il a semblé que dans tous les cas les cinq premiers intervalles étaient suffisants pour établir une classification. Pour la musique du Moyen âge et de la Renaissance, il a fallu tenir compte du fait que dans les différents manuscrits ou éditions d'une même composition on remplaçait souvent une valeur longue par plusieurs plus petites: par exemple une brève pouvait être remplacée par deux semi-brèves et dans ce cas les deux variantes ne se rangeaient pas dans le même groupe comme le montre l'exemple de Busnois déjà cité par Koller: *Seul a per moy :*



On a évité cet inconvénient en omettant de noter les notes répétées. Peut-être a-t-on poussé un peu trop loin ce principe en l'appliquant sans raison très valable à la musique des 17ème et 18ème siècles.

Quel thème choisit on ? Pour les polyphonies jusqu'à la fin de la Renaissance, la partie de *superius*. Pour la mélodie accompagnée, la partie qui porte les paroles. Pour les sonates pour violon et piano, la partie de violon. Pour la musique symphonique, le plus souvent le premier violon à moins que le thème ne soit nettement exposé à une autre voix, auquel cas c'est celle-ci que l'on note.

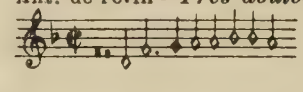
On a pu grâce à ce catalogue identifier un assez grand nombre de pièces anonymes perdues dans des recueils, dans ceux publiés par Ballard, entre autres. Pourtant ce classement qui semble répondre à toutes les exigences musicales possède un défaut très grave: il ne tient aucun compte des différentes transpositions d'une même composition et ainsi les deux versions de *Una mosque de Biscaya* de Josquin se trouveraient séparées dans notre fichier:



Koller qui s'était bien aperçu de cet inconvénient écrivait en 1903 que pour résoudre cette question il ne comptait plus que sur un heureux hasard ! En 1942, le hasard avait encore bien mal fait les choses puisque nous avons toujours continué notre fichier d'incipit sur les mêmes bases.

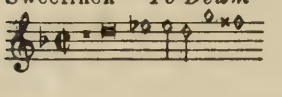
Or justement, la question primordiale, la seule qui importe, c'est de trouver un classement qui permette de rapprocher toutes les transcriptions d'une même oeuvre et pour cela il faut une méthode qui tienne compte des intervalles exacts sans se préoccuper de la note de départ. Tant que ce but n'est pas atteint, on ne peut pas parler de classement. J'ai eu alors l'idée de rejeter ce système de lettres sur lequel on s'est hypnothisé pendant si longtemps et d'adopter des symboles tout autres: les chiffres. La note de départ, quelle qu'elle soit, sera toujours notée o entre crochets carrés. Chaque demi-ton partant de cette première note est représenté par un chiffre précédé de + pour les intervalles ascendants, de — pour les intervalles descendants. On dispose donc de douze chiffres pour noter toute la musique car on ne tient pas compte de l'octave réelle. Le thème de Busnois que nous avions tout à l'heure sera noté ainsi: [o], +7, +5, +4, +2
Voici encore quelques exemples:

Ant. de Févin - *Très doulce dame de bonnayre*



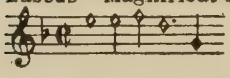
= [0], + 3, + 5, + 7, + 8

Sweelinck - *Te Deum*



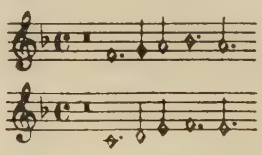
= [0], + 1, 0, + 5, + 4

Lassus - Magnificat septimi toni - *Et exultavit*



= [0], + 2, + 3, 0, - 7

Si nous reprenons la *Mosque de Biscaye* de Josquin, avec cette nouvelle notation en chiffres, les deux versions se trouvent réunies:



= [0], + 2, + 4, + 5, + 4

= [0], + 2, + 4, + 5, + 4

Pour le classement des cartes, on peut séparer le fichier des + du fichier des — et, à l'interieur de chacun d'eux, le signe + étant toujours classé avant le signe —.

Voici donc une méthode qui semble permettre d'identifier une oeuvre et de retrouver un thème en dehors de toute notion de tonalité ou de mode. Elle est aussi la seule qui tienne compte de tous les accidents et peut de ce fait s'appliquer à toute la musique y compris la musique atonale.

Paris, Bibliothèque nationale.

DA « DABUDÀ » STRUMENTO MUSICALE A « DABUDÀ » MILLANTATORE

MARIO FERRARA

Con la presente nota cercheremo di mettere un po' d'ordine intorno a ciò che si sa e si è detto sul vocabolo *Dabudà,* facendone la storia e chiarendone i rapporti con la musicologia e con la letteratura. La via legittima da percorrere sarà, pertanto, quella dei testi che ce lo hanno tramandato. Per ognuno di essi raccoglieremo analiticamente tutti gli elementi utili alle ulteriori conclusioni.

I. Franco Sacchetti (Firenze, c. 1330- c. 1400) — *Novella XXXVI* (in *Novelle,* ediz. Gigli, con note del Borghini, Bottari, Follini. Firenze, Le Monnier, 1886, vol I, p. 96; in *Novelle scelte,* ediz. Osimo. Milano, Vallardi, 1928, p. 65; in *Il Trecentonovelle,* ediz. Pernicone. Firenze, Sansoni, 1946, p. 88; in *Il libro delle Trecentonovelle,* ediz. Li Gotti. Milano, Bompiani, 1946, pp. 100 [testo], 672 [note]).

La novella narra di tre fiorentini che, durante la guerra tra Pisa e Firenze, si affrettano a riferire ai Signori, con accesa foga, che il nemico batte alle porte della città: il primo aveva però scambiato il fracasso di una tempesta d'acqua e di vento per quello dell'esercito in marcia; il secondo aveva visto alcuni buoi in fuga e avèva creduto che corressero così sbandati per l'incalzare dei Pisani; il terzo, mercante di professione ma che la pretendeva a uomo d'arme, si era illuso di aver saettato un verrettone nel campo avverso e d'averne fatto strage, mentre in realtà l'aveva scagliato oltr'Arno contro una cortina di nebbia. Ciò premesso, il Sacchetti conclude: « *Così furono avvisati questi signori in pochi dì da tre valentri uomini di guerra di tre cose sì fatte, che 'l Daduba n'averebbe scapitato* ». Alla qual chiosa fa seguire una gustosissima rappresentazione degli eroi da poltrona, che « standosi a fare l'arte loro, dicono: Noi abbia-

mo sconfitto li nimici; come fa la mosca, che è in sul collo del bue, quando li fosse detto: Che fai, mosca? e quella dice: Ariamo ».

Che cosa ne dicono i commentatori ?

Bottari — « Alcuno ha creduto doversi spiegare in questo modo, forse: *quegli da Buda.* E 'l Vocabolario, alla voce *Dabbuddà,* rapportando questo passo del Sacchetti, e' dice: *Dabbuddà, strumento simile al buonaccordo, ma senza tasti* ecc. e che 'l Sacchetti siasi servito del nome dello strumento per significare il sonatore; la qual cosa non fa punto al proposito, non avendo niente che fare in questo luogo un sonatore di Dabbuddà, parlandosi di cose di guerra, e di percuotere e di dare. Laonde a me pare che in cotali dichiarazioni siasi preso abbaglio; ed ho letto sempre in questo luogo *Dabbudà,* giudicandolo un nome fantastico all'uso della plebe fiorentina, per significare uno millantatore, uno che dà o minaccia di dare; vedendosi ripetuta la sillaba *da* due volte nella medesima parola, siccome la nostra plebe dice ancora di simili suggetti: *egli è un dante* ».

Osimo — « Parola oscura e oscuramente spiegata. Forse si è bene apposto il Bottari « giudicandolo un nome fantastico all'uso della plebe fiorentina, per significare un millantatore, uno che dà o minaccia di dare ».

Pernicone — « Non si sa a chi o a che cosa il S. si riferisca. Non persuade la spiegazione che qui si tratti del *dabbuddà,* strumento musicale e che il S. si sia servito del nome dello strumento per indicare il sonatore; nè l'altra del Bottari che vuol leggere *dabbudà* " giudicandolo un nome fantastico all'uso della plebe fiorentina, per significare uno millantatore, uno che dà o minaccia di dare, vedendosi ripetuta la sillaba *da* due volte nella medesima parola ". Dal senso del discorso a me parrebbe si tratti di un nome proprio ».

Li Gotti — « Persino il Dabudà avrebbe fatto cattiva figura. Il Dabudà è probabilmente un tipo popolare di millantatore, come diciamo " Gradasso ". La parola avrebbe origine dalla onomatopea *da-bu-da;* uno che dà o minaccia di dare ».

Dei quattro editori qui ricordati, solo il Li Gotti si attiene alla forma *Dabudà* accentata, in accordo con la spiegazione che ne offre.

Citiamo anche Franz Pieper, *Franco Sacchetti Bürger von Florenz und Dichter* etc. Marburg, 1939, p. 138, il quale registra, desumendoli dai lessici e dalla nota del Bottari, i tre significati del vocabolo, senza per altro decidersi a favore di alcuno di essi: « *Dabuda* — Eigentlich ein Saiteninstrument, das mit 2 Klöppeln gespielt wurde (Art Xylophon?),

übertragen auch der Spieler dieses Instrumentes; nach Bottari ein phantastisches, vom niederen Volke in Florenz gebrauchtes Wort, soviel wie millantatore " Aufschneider " ».

Ci resta da dire che il passo sacchettiano trovasi citato nelle tre prime impressioni (1612, 1623, 1691) del *Vocabolario della Crusca,* le quali riportano il vocabolo nella forma *Dabbuddà,* dandole il senso traslato, cioè di nome del suonatore di quello strumento « sì come anche si dice il Piva, il Tamburino, il Naccherino ». Nella quarta impressione (1731) si dà soltanto come « detto per ischerzo ». Nella quinta (1863), la citazione viene eliminata. Il *Tommaseo-Bellini,* quindi, rifacendosi dal Menagio e dalla Crusca, pone il luogo del Sacchetti in paragrafo a parte, confermando a *Dabbuddà* il senso traslato e scherzoso. Gli altri lessici trascurano il rinvio alla novella.

II. Burchiello (Firenze, c. 1400-1448) — Sonetto *O ser Agresto mio, che poeteggi* (in *Sonetti* etc. Londra, 1757, p. 127).

Fra la corrispondenza poetica del Burchiello con Leon Battista Alberti v'è questo sonetto, in cui ai primi due versi:

O ser Agresto mio, che poeteggi
e che tanto ben suoni il dabbudà

fa sèguito la proposta di alcuni quesiti scherzosi, secondo l'uso della poesia burlesca. I riferimenti biografici del Burchiello all'Alberti sono precisi: questi fu, infatti, poeta, studiò leggi (vedi v. 8), coltivò come occupazione preferita la musica. Ce lo apprende il suo più autorevole biografo[1] là dove dice: « Battista, nato da padre espertissimo nella musica, non solo trasse diletto da quest'arte divina, ma senza maestri l'apprese e compose cantate che piacquero ai dotti musici. *Suonò diversi strumenti* e l'organo in modo da essere annoverato fra i valenti organisti, insegnando ancora a suonarlo con certi suoi metodi. Amò il canto e vi si esercitò pur da vecchio fra le pareti domestiche, in villa, o in compagnia del fratello e de' familiari ».

(1) G. Mancini, *Vita di Leon Battista Alberti,* 2ª ediz. Firenze, Carnesecchi, 1911, p. 40.

Nessun dubbio, pertanto, che qui si accenni ad uno strumento musicale, chiamato *dabbudà*. In tal senso i lessici lo citano dal Burchiello.

In mancanza di commenti, abbiamo raccolto noi questi brevi cenni illustrativi.

III. Alessandro Braccesi (Firenze, 1445-1503) — Sonetto inedito *Quello spirto gentil ch'a l'universo* (in *Cod. Vaticano Lat.* 10681, c. 47ᵛ).

È un esempio inedito, da noi rinvenuto nel canzoniere burchiellesco del Braccesi. Dato il peculiare carattere di siffatto genere di poesia, poco profitto può ricavarsi dal contesto del componimento per l'intelligenza del passo che a noi interessa. La quartina iniziale non ha rapporto con gli altri versi ed è essa stessa di dubbia interpretazione nel suo complesso.

Quello spirto gentil, ch'a l'universo
diè già gran briga col sanguigno Marte,
usò tanto il suo ingegno e le sue arte,
che 'l dabbuddà costrinse mutar verso.

Trasferendoci dalla lettera allo spirito del contesto, si riesce ad intendere che il Braccesi allude ad un famoso personaggio — petrarchescamente chiamato *spirto gentil* —, il quale, dopo avere insanguinato il mondo con le guerre, seppe adoperar tanto il suo ingegno e le sue arti da far procedere diversamente le cose, forse riportando nel mondo la pace.

Abbiamo detto « far procedere diversamente le cose », ma avremmo potuto dire, con metafora musicale più aderente al testo e con espressione più popolare, « far cambiar musica » o « far mutar registro », e in entrambi i casi avremmo tradotto ciò che il Braccesi ha espresso con il « mutar verso » del dabbuddà. Il quale senza dubbio, anche qui, come nel Burchiello, indica uno strumento musicale.

IV. Anonimo Toscano (sec. XV) — Sonetto inedito *Calamai rotti e pennaiuoli 'nfilzati* (in *Cod. Venturi Ginori N. 3*, c. 323ᵛ. Proprietà del Marchese Roberto Venturi Ginori di Firenze).

Anche questo esempio è inedito e ci è occorso di trovarlo in un'importante raccolta di rime quattrocentesche toscane.

Il sonetto che lo contiene è un guazzabuglio del più spiccato carattere burchiellesco, cui fa da chiusa la seguente terzina:

I' vidi un cicalino
soldar gran gente per ire in Guascogna,
sonando il dabuddà in sulla zampogna.

O qui si allude al già noto strumento o si allude ad un motivo musicale che dallo strumento musicale prendeva il nome. Conoscendo, tuttavia, gli stravaganti modi di codesto genere burlesco, per cui l'illogicità è ragione e motivo di poesia, la seconda ipotesi ci sembra da respingere.

Qui, d'altra parte, potrebbe volersi dire che il cicalino suonava la zampogna applicandovi sopra le zampette, così come con le mani si suonava il dabuddà. L'esempio seguente del Varchi metterà in evidenza questo particolare. Per noi, dunque, anche in questo caso si allude allo strumento.

V. Benedetto Varchi (Firenze, 1503-1565) — *L'Ercolano*. Firenze, Giunti, 1570, p. 266.

Dissertando sul ritmo e sostenendo che non è la natura a suggerirlo, sibbene l'arte, il Varchi procede per esemplificazione e dice: « Il medesimo fiato e la medesima forza ricerca il sonare un corno che il sonare una cornetta, ma non già la medesima industria e maestria; *e tanto mena le braccia colui che suona il dolcemele o il dabbudà, quanto colui che suona gli organi,* e insomma l'arte è quella che dà la perfezione alle cose ».

Abbiamo qui il primo esplicito accenno al modo come si suonava il dabbudà, un accenno insufficiente certo a darci l'idea chiara dello strumento stesso, ma tale da legittimare le definizioni formulate dai lessici della nostra lingua, i quali, d'altra parte, non sappiamo a quale fonte abbiano attinto. Le prime tre impressioni del *Vocabolario della Crusca* lo definiscono così: « Strumento simile al Buonaccordo, ma senza tasti, oggi anche chiamato Ogniaccordo, e si suona con due bacchette, che si battono in su le corde ». La quarta impressione, variando: « Strumento musicale simile al Buonaccordo, ma senza tasti, oggi chiamato Saltero ecc. », da cui derivano il *Tommaseo-Bellini* e il *Manuzzi*. La quinta, infine: « Strumento musicale con le corde di metallo, di figura simile a un'arpa a giacere, che si suonava battendo due bacchette sopra le corde. Dall'arabo *dabdâb* o *dabdâba* ». Lo *Zingarelli*: « * Ar. *Dabdab* timpano. Strumento con le corde

di metallo, orizzontale, che si sonava con due bacchette o coi ditali. Salterio ».

Strano è, tuttavia, che dai lessici della nostra lingua questo termine non sia passato nei dizionari musicali.

Potremo essere stati negligenti nella ricerca: comunque, al fine di evitare inutili consultazioni agli studiosi, diamo qui l'elenco delle opere cui abbiamo invano ricorso: 1) F. Blanchinus, *De tribus generibus instrumentorum musicae veterum organicae dissertatio.* Romae, 1742; 2) Bonanni, *Descrizione degl'istromenti armonici d'ogni genere,* ecc. 2ª ediz. Roma, 1776; 3) Fétis, *Histoire général de la musique.* Paris, 1869; 4) Rambosson, *Les harmonies du son et l'histoire des instruments de musique,* Paris, 1878; 5) B. Cecchetti, « Appunti sugli strumenti musicali usati dai Veneziani antichi », in *Ateneo Veneto,* XXXV (1888), pp. 73-82); 6) Riemann, *Musik-Lexikon,* più edizioni; 7) Fuller Maitland in *Grove's Dictionary of Music* ecc.; 8) J. Schlosser, *Alte Musik Instrumente.* Wien, 1920; 9) A. Bonaventura, *Storia degli strumenti musicali,* 3ª ediz. Livorno, 1926; 10) A. Schiaffini, « Su denominazioni di provenienza francese di strumenti musicali », in *Italia dialettale,* IV (1928), pp. 224-230; 11) F. W. Galpin, *Old English Instruments of Music. Their History and character.* London, 1932; 12) W. Heinitz, *Instrumentenkunde.* Postdam, 1934; 13) F. Limenta, *Dizionario lessicografico musicale.* Milano, 1940; 14) G. Barblan, *Musiche e strumenti musicali dell'Africa orientale italiana.* Napoli, 1941; 15) R. Profeta, *Storia e letteratura degli strumenti musicali.* Firenze, 1942.

A parte ricordiamo la fondamentale opera di Curt Sachs, *Real-Lexicon der Musikinstrumente.* Berlin, 1913, nella quale trovasi registrato un « *Dabdabi,* grus. Trommel; nicht von pers. deff, sondern von debdebe », forse affine o uguale al nostro strumento; ma intorno a siffatta questione non abbiamo competenza per dire una parola conclusiva.

Avremmo voluto consultare Emile de Travers, *Les instruments de musique au XIV siècle.* Paris, 1882, ma non ci fu possibile rintracciarne copia.

VI. Bartolomeo Corsini (Barberino di Mugello, 1606-1673) — *Il Torracchione desolato.* Poema eroicomico ecc., a cura di G. Baccini. Firenze, 1887, pp. 47 [testo], 63 [nota].

Un guerriero, peregrinando, trova una donna che sta per darsi la morte;

la persuade a desistere da quell'atto disperato e le chiede perchè mai si fosse ridotta a tal punto.

Ed ella a lui: Signor, pria ch'io mi scordi
d'un tanto benefizio, i dabbuddà
anteposti saranno ai buonaccordi,
ed alli storïoni i baccalà....

Da tal preambolo, che, tradotto in termini più espliciti, significa « Sarà impossibile che io mi scordi di così grande favore » si trae una testimonianza di assai notevole interesse, che cioè il dabbuddà fosse uno strumento più popolare e, diremo quasi, più umile del buonaccordo. Essi stanno, infatti, contrapposti come il baccalà al fine e pregiato storione.

La oscura storia di questo strumento si arricchisce, pertanto, di un'altra notizia.

Il Baccini, annotando, cade in clamoroso errore allorchè identifica dabbuddà e buonaccordo con due « Sonate dette così, che si eseguivano sugli strumenti a corda ». Il testo non autorizza affatto ad istituire una siffatta duplicità di significato.

VII. Francesco Redi (Arezzo, 1626-1698) — *Bacco in Toscana.* Ditirambo etc. con le Annotazioni. Firenze, Matini, 1685, pp. 20 [testo], 91 [nota].

I versi del Redi sembrano dar conferma a ciò che abbiamo appreso dal Corsini. Essi invitano esplicitamente delle contadine a strimpellare il dabbuddà, quasi che questo sia lo strumento idoneo al loro gusto e al loro costume.

Cento rozze forosette,
strimpellando il dabbuddà,
cantino e ballino il bombababà.

La nota che vi appone il Redi è tolta di peso dal Vocabolario della Crusca, e noi già la conosciamo. Il Redi, tuttavia, aggiunge un nuovo esempio, che dice di aver tratto da un testo manoscritto intitolato *Vanto di Rinaldo,* testo, come vedremo fra poco, di assai dubbia esistenza. La

nota si chiude con un accostamento — limitato al suono delle due parole — tra il dabbuddà e il napoletano *zuchezzù* « strumento che suonano le maschere per carnevale ».

VIII. Anonimo (sec. ?) — *Vanto di Rinaldo* (segnalato dal Redi nelle Annotazioni al *Bacco in Toscana* cit., p. 91).

Il Redi, come si è qui sopra accennato, cita da un manoscritto di sua proprietà, intitolato *Vanto di Rinaldo,* il seguente passo: « *Una damigella della Regina sonava il Dabbudà con due bacchette d'avolio* ». Trattandosi d'un antico romanzo di cavalleria, da far risalire al sec. XIV, l'esempio sarebbe suggestivo.

Indotti da scrupolo di diligenza e di completezza, ci ponemmo alla ricerca di codesto manoscritto o di una sua eventuale stampa.

Le più autorevoli bibliografie di romanzi cavallereschi, gli studi specifici ed esaurienti condotti dal Rajna su Rinaldo da Montalbano, le storie letterarie ecc. ecc. non ci davano però notizia di un'opera di quel nome. Esplorammo allora il copioso fondo dei manoscritti Rediani conservato nella Biblioteca Laurenziana, e gli altri delle Biblioteche Nazionale e Marucelliana, ma quel manoscritto non fu rintracciabile. Adoperammo tutta la nostra pazienza nel leggere la *Storia di Rinaldo da Montalbano* contenuta nel Cod. Laurenz. Plut. 42, cod. 37, che, per quanto scritta in versi, ci lasciava nutrir la speranza di rintracciarvi quell'allusione, ma la fatica fu delusa. Leggemmo, continuando il viatico della ricerca, uno spoglio di voci dalla *Storia di Rinaldo,* contenuto a cc. 108^{r}-108^{v} del Cod. Riccard. 2197, ma la lettura fu infruttuosa. Consultammo, con maggior fiducia, i Codd. Rediani 194, 195, 196, 197 della Biblioteca Laurenziana, nei quali il Redi radunò i suoi spogli linguistici da servire per correzioni e aggiunte alla 2^{a} ediz. del Vocabolario della Crusca, ma nè il *Vanto* nè il *dabbudà* trovammo mai ricordati. E allora? Dovemmo purtroppo cedere al dubbio — per non dire alla certezza — che, anche in questo caso — come negli altri numerosi denunziati da Guglielmo Volpi [1] —, il Redi si fosse reso colpevole di falso.

Di sua pura invenzione, pertanto, fino a prova contraria, deve ritenersi l'esempio qui sopra riportato.

(1) « Le falsificazioni di F. Redi nel Vocabolario della Crusca », in *Atti della R. Accad. d. Crusca,* 1915-1916, pp. 33-136.

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Il lettore avrà agevolmente capito che, mentre per il Sacchetti ci siamo limitati alla semplice raccolta degli elementi illustrativi, per gli altri autori invece abbiamo esercitato la nostra critica spingendola fin dove essa poteva e, secondo la nostra competenza, doveva giungere. La ragione si è che per il Sacchetti v'è un nodo da sciogliere ed esso non può sciogliersi, sia pure in via di ipotesi, se non in sede di conclusioni. Occorreva, infatti, stabilire prima alcune premesse, utilizzando i nuovi testi e approfondendo l'esame di quelli già noti attraverso i lessici.

Giunti al tirar delle somme, desideriamo premettere un dubbio sulla esattezza della definizione che i vocabolari danno del *dabbuddà* come strumento musicale. Le fonti che essi citano sono il Sacchetti — e per esso rilevano il senso traslato —, il Burchiello, il Varchi, il Corsini, il Redi; ma codesti autori non avrebbero potuto autorizzarli a descrivere il dabbuddà con i particolari con cui l'hanno descritto. D'altra parte, se altra fonte essi avessero avuta, l'avrebbero menzionata. Hanno, perciò, attinto la loro definizione dal vero? o hanno integrato le notizie di quegli autori per via d'induzione? Il dubbio, comunque, è da riferirsi alla prima stampa del Vocabolario della Crusca (1612), perchè gli altri lessici si sono tutti press'a poco riportati ad essa.

Stando, pertanto, ai soli testi, da essi apprendiamo, in definitiva, che il *dabudà* era uno strumento musicale già in uso fin dalla fine del Trecento, che esso si suonava menandovi su le mani, che era di uso popolare e forse rusticano, che la sua esistenza è testimoniata anche nel Seicento inoltrato, sempre però che le tarde citazioni del Corsini e del Redi non si vogliano considerare d'origine puramente letteraria, desunte, cioè dalla tradizione.

Resta da esaminare il passo del Sacchetti.

Fra i commentatori esiste concordia intorno ad un fatto: che il Sacchetti ha indicato un nome di persona. Ma la concordia diventa poi discorde allorchè son da decidersi per un nome fantastico di creazione popolare allusivo, attraverso la sua struttura onomatopeica, al tipo del millantatore che « dà o minaccia di dare » (Bottari, Osimo, Li Gotti); o per un nome proprio di persona (Pernicone). La concordia ritorna nel negare qualsiasi riferimento al *dabudà* strumento musicale o al *dabudà* suonatore dello strumento stesso. Se si dovesse accettare il voto di maggio-

ranza, sarebbe da accogliere senz'altro il deliberato del Bottari, rigettando quello del Pernicone. Ma, a questo punto, entrano in campo la nostra funzione critica e il nostro diritto a pronunziare una sentenza, sia pure passibile di appello.

Diciamo subito che la maniera sbrigativa del Pernicone non ci soddisfa nè persuade. Quand'egli dice che « non sa a chi o a che cosa il Sacchetti si riferisca », dichiara, è vero, onestamente la sua insufficienza, ma non penetra, come avrebbe dovuto, il senso di tutto il contesto, da cui almeno avrebbe potuto trarre la conclusione che ad un millantatore il Sacchetti con certezza si riferisce. E quando, invece, contraddicendo al Bottari, conclude che dal senso del discorso « parrebbe si tratti di un nome proprio », non s'avvede che anche il *Dabudà* del Bottari, impersonando il tipo del millantatore, diventa esso stesso un nome proprio.

Restiamo, dunque, col Bottari e col Sacchetti. E ci chiediamo: non è strano il fatto che la plebe fiorentina creasse « fantasticamente » la voce *Dabudà* nel momento stesso in cui esisteva uno strumento musicale dell'identico nome? E non invita a significativa riflessione il fatto che è proprio il Sacchetti, creator di musiche e intenditor provetto di musica [1], ad usare quel vocabolo? Due interrogativi, questi, cui non può rispondersi che riducendo le due voci ad una, e riportando questa alle origini del suo significato musicale.

A noi dunque, ora, finalmente, il compito di concludere.

Il millantatore è, come ognun sa e come oggi si dice, uno che le spara grosse, alle cui smargiassate si suole rispondere, imitando lo scoppio dello sparo, con un *bum!* o simili. Il millantatore altresì, per dar vita e verità alle sue immaginazioni, suole agitarsi, muover le braccia, gesticolare. Chi lo ricercasse nella tradizione letteraria, a cominciare dal plautino *Miles gloriosus,* ne troverebbe vivaci rappresentazioni, ma noi preferiamo segnalare, perchè più istruttivo, un luogo del cinquecentista Giovan Paolo Lomazzo [2], il quale, suggerendo ai pittori e agli scultori i modi con cui atteggiare i millantatori e vanagloriosi, fa loro sapere che negli atti essi sogliono « galeggiare sempre, grillare, gongolare, *torcersi, dibattersi* ecc. ».

Bene, pertanto, si conveniva al millantatore il battesimo col nome di

(1) E. Li Gotti - N. Pirrotta, *Il Sacchetti e la tecnica musicale del Trecento italiano.* Firenze, Sansoni, 1935.

(2) *Trattato dell'arte della pittura, scoltura et architettura* ecc. Milano, Pontio, 1585, p. 140.

Dabudà, cioè con un nome rievocante, attraverso il suono esplosivo delle sue sillabe (Bottari), e attraverso la pittoresca immagine del suonatore agitantesi con le braccia (Varchi), la figura del gradasso.

Il *Dabudà* sacchettiano è per noi, dunque, il suonatore dello strumento stesso, preso, in virtù della suggestione evocativa del nome e dell'atteggiamento, a personificare il millantatore.

Nulla di strano in codesto processo, tutto proprio della nativa arguzia, del vivo senso comico, della ricca fantasia immaginativa del popolo e del popolo fiorentino in ispecie. Ci viene alla memoria un altro esempio, affine a quello del Dabudà, per cui il nome di un pomposo cavallo della famiglia Benci, chiamato il *Secento,* veniva preso dal popolo a colorire la personificazione dell'uomo superbo e tronfio di boria.

Firenze (Florence)

A FOURTEENTH-CENTURY FLORENTINE TREATISE IN THE VERNACULAR

ARMEN CARAPETYAN

Although musical history must yet trace its origins and early development, the Florentine school of the pre-Medicean epoch is a fact by now well enough established, if not well enough recognized by all historians[1]. This school comprised composers of high spirit and high ability, and we may safely assume that during the 14th century it made Florence a brilliant centre of music. The composers of this school, Francesco, Giovanni, Gherardello, Jacobo (da Firenze), Lorenzo Masini, Piero, Donato da Cascia, Franco Sacchetti (the poet, of whose compositions, however, none has been discovered), Paolo (at the turn of the century), Andrea (dei Servi, active at the beginning of the 15th century), carried polyphonic art to one of its high peaks. Francesco (Landini) has already been compared with the great French master, Guillaume de Machaut; others are relatively little known, for the bulk of their works must yet be brought to light[2].

This bright epoch in the history of music holds for us masterpieces of polyphonic music of a lyrical kind. These masterpieces surely imply the existence of a local tradition, unfortunately to our view still in dim light, if not in darkness. But one cannot help thinking of the rich soil of a well developed and highly cultivated tradition of polyphonic art, out of which must have sprung these masterpieces.

[1] Already nearly half a century ago J. Wolf published a study on the subject, though without claiming a « school »: « Florenz in der Musikgeschichte des 14. Jahrhunderts », in *SIMG*, III (1902), 599.

[2] The following is a list of Mss containing works by Florentine composers (the list is not exhaustive, but the principal sources are included):

Rome, Bibl. Vat. Rossi 215.
Paris, Bibl. nat., ital. 568.
Florence, Bibl. Mediceo-Laurenziana, Pal. 87.
London, Br. Mus., Add. 29987.
Paris, Bibl. nat., franç. n. a. 6771 (all works in this Ms by Florentines — chiefly Francesco — are found in Pal 87 and Panc. 26).
Rome, Bibl. Vat., Ottob. 1790.
Rome, Bibl. Vat., Urb. lat. 1419.
Padua Bibl. univ. 684 & 1475.
Oxford, Bodl. Can. Scr. eccl. 229.
Lucca (Mancini) codex (Cf. *Musica Disciplina*, III).

Such a rich tradition had doubtless also its theoretical spokesmen. But history has left us no musical treatise that might be considered as the particular theoretical expression of the Florentine tradition. To be sure, Italy of the 14th century does not abound with theoretical works, and her most important theorist of the time, Marchettus of Padua, was separated from the banks of the Arno not only by distance but by differing political and social conditions. At all events, it is possible that the masters of the capital of Tuscany used an oral tradition in teaching their pupils, never writing down their doctrine, or that they used treatises written elsewhere.

The treatise that is the subject of the present study is one of the three theoretical works of Florentine origin so far come down to us, and it undoubtedly represents an oral tradition of musical teaching in Florence of the 14th century[3]. It cannot be considered as the formulation of the doctrine that nourished the works of the great Florentine masters, for its teaching is rather elementary; nor is it a treatise, as such, of the greatest importance. Nevertheless, it is not of insignificant interest, as it will be seen. Besides its theoretical interest, consisting chiefly of an original and rich terminology, our treatise is one of the very few theoretical works written in the Tuscan dialect and of Tuscan origin.

* * *

The *Notitia del valore delle note del canto misurato* is kept at the Biblioteca Mediceo-Laurenziana in Florence.* It was copied together with six other short treatises, all in the vernacular. The codex, which is an *unicum*, bears the call-number: Redi 71. It measures 216 × 144 mm., and it still keeps its original leather binding. Inside this binding one reads: « Regole del canto », by a later hand. The codex contains 81 folios of paper and two fly-leaves of parchment, of which the first, on its *verso*, bears: « A uso di $\overline{\text{sr}}$ laudomina » (or « landomina »).

The folios of the codex are marked by pencil in Arabic numerals and of course by a modern hand. Folios 60-81 are blank, intended for the copying of other treatises, as shown by the « Tavola » on fol. 1r-v (see below), but never executed.

The codex contains no ornamentation, except initials and titles in red

[3] Of the other two, the rather inconsequential *Arte del biscanto misurato secondo il maestro Iacopo da Bologna* (found in the same codex containing our treatise) was published by J. Wolf in *Theodore Kroyer - Festschrift zum sechzigsten Geburtstage ...*, Regensburg, 1933. The third treatise of Florentine origin, *Ars ad adiscendum contrapunctum secundum Magistrum Paulum de Florentia*, is found in the manuscript Ashburnham 1119 at the Bibl. Mediceo-Laurenziana.

* The writer wishes to thank the Librarian, Dottoressa Teresa Lodi, for kind co-operation in this and other instances.

ink. Fols. 18v, 19r, 25r, 25v, 26v, 27r, 27v, 28r, 28v carry red notes in musical examples. The manuscript is by various Italian hands, copied probably in the first years of the 15th century.

A table of contents, by *incipit* and *explicit*, of the whole codex follows:

11v « Tavola »

1. 2r « Ad avere alcuna notiçia del canto & prima della mano.
Per che nota la mano avere xx positioni»
13r « — Et questo dicto sia per abastança succinctamente allo scolaro per canto piano. Deo gratias. Amen »
2. 13r « Per avere alcuna notitia del valore delle note del canto misurato et di loro divisione
Per che dico essere note del canto misurato sei »
24r « — Una compositione di note piu volte repetuta parebbe Et non altro. Deo gratias »
3. 24v « Ad avere alcuna notitia del contrapuncto
Per che dico il contrapuncto richiede avere quatro cose »
28v « — si puossono fare per ogni nota da ut al la per grado in viii[a].
Esemplo (followed by a blank stave) ».
The writer wishes to thank the Librarian, Dottoressa Teresa Lodi, for Kind co-operation in this and other instances.
4. 29r « Ciascuno che desidera essere amaestrato assai competentemente nell'arte pratica del misurabil canto servi quelle cose diligentemente le quali seguitano somariamente secundo il maestro giovani de çuri
Cinque sono le parti della prolatione »
40v « — Et così si fanno diverse note » (followed by examples on fol 41r. This treatise is a translation of *libellus cantus mensurabilis*, attributed to Johannes de Muris).
5. 41v « Questa e l'arte del biscanto misurato secundo el maestro iacopo da bologna
Queste regole et divisioni dell'arte musica »
48v « — Le quattro semiminime vaglono tre minime così come qui (example)
Deo gratias Amen » (published by J. Wolf, in *Festschrift Kroyer*, 17-39).
6. 48v « Dico che noi abbiamo nel contrapuncto quattro gradi »
59r « — Bisogna avere ben in pratica questo ordine che e prestitivo allo scolare.
Deo gratias. Amen »
7. 59r « Qui si comincia lo capitolo delle proportione pertinente al contrapuncto

« (P)roportioni in musica nelle quali consistono le consonantie sono sei »

59v « — Et questo basta quanto che s'apartiene al capitolo delle proportioni »

The table of contents of the codex, which as it will be seen does not correspond to the table given above, is as follows:

Regula di canto piano 1
Del segno della mano 3
Dei modi Dello intonare 5
Delle specielta del canto 7
Delli otto modi de tioni di piu cose 10

Regula del canto misurato 17
De quatro modi da compore note. 19
De quatro modi imperfecti 21
Delle prolationi e quante sieno 22
De puncti e quanti sieno 23
Come si cognosce la prolatione mediante i lor segni. 27
Della sincopa 28
Della diminutione 28

Regola del contrapuncto 31
Della dimostratione de gradi 34
Del contrapuncto per ogni grado dal ut. a la. . . . 36

Regola di gian de muris sup canto misurato. . . . 40
Della alteraçione. 43
Delle legature 45
Delle pose 46
Della diminutione 47

Regola di mestro iacopo da bologna di canto misurato 49
Delle pose 50

Regola di contrapuncto optima 56

Regola di canto piano 66

Regola delle proportioni 76

Regola di jan de muris di contrapuncto 84
Delle diminutione di contrapuncto 85

* * *

It has already been said that the *Notitia* presents an elementary text of mensuralist teaching. Its language and its style correspond to its pedagogic purpose. Before the 16th century a musical treatise in the spoken rather than in the learned tongue is indeed an uncommon thing. It is to be assumed that at the time when the *Notitia* was written down, a treatise in the vernacular was destined for those who were incapable of reading Latin. Our treatise is thus one of the early instances of popularization of musical theory. It is a short exposition of the rules of mensuralist notation, and it is interesting to us for its reflection of elementary musical instruction in Florence of the 14th century. The inscription on the *verso* of the first fly-leaf cited above, « A uso di s̄r laudomina » is suggestive. It appears that

the work was written for the use of a woman of some religious order, or for the use of a convent itself, where, as it is well known, girls received their education. It is, moreover, known that such feminine institutions did not always command a knowledge of the Latin language; for we even find that Breviaries with rubrics in the vernacular were specially prepared for them. Our treatise, then, was probably used either for the instruction of the inmates of some convent in Florence or for the instruction of girls educated there, or for both purposes.

It is curious that while the work was written for inferior instruction, accordingly being also in a simple conversational style and bearing even grammatical inaccuracies, it presents us on the other hand with unfamiliar terminology and technical expressions. It must be assumed that these expressions are not peculiar to our treatise alone, but that they are representative of the Florentine school; for it is not likely that a textbook intended for simple instruction and probably drawing upon oral tradition be the originator of novel technical expressions.

These considerations, together with others to be discussed presently, lead us to suspect that some learned treatises of the 14th century have been lost to us. In fact we know that such is the unfortunate case, as clearly shown by statements like that of Prosdocimus who in support of his assertion that mensuration in *modus* and *tempus* was an Italian thing refers to Marchettus and to « Quamplures alii qui in hoc arte Ytalica antiquius scripserunt »[4].

But we cannot simply pass to the conclusion that the *Notitia* may be the vernacular version of a learned treatise in the learned tongue. Of this improbability we have already told. Here we must add that our treatise, *unicum* as it is, is doubtless not even the archetype, because numerous scribal errors and the generally corrupt text suggest earlier copies and many reproductions. This however would mean that the work had a certain diffusion, and it contributes to our interest in it as an example of school-text for elementary instruction of notation in Florence of the 14th century.

Besides the probability of several reproductions just suggested there are some technical features in the treatise that would point to the last part of the 14th century as the time of its composition. The work includes hollow red notes, which were unknown before the second half of the century, neither being used by composers nor discussed by theorists. So far as the present writer knows, hollow red notes were first explained by Filipotus de Caserta in his *Tractatus de diversis figuris*, which was written in the second half of the century[5]. Such compositions, too, of the Florentine

[4] See C. Sartori, *La Notazione italiana del trecento* (1938), 90.
[5] Coussemaker, *Scriptorum* ..., III.

school that carry hollow red notes are undoubtedly of the second half of the century.

Another technical feature in our treatise bearing upon its approximate date is the inclusion in its discussion of the *modus maximarum*. This rhythmic mode receives no attention by the writer of the *Ars nova*, although in reality it was used, especially by the Florentines. It appears that from among the learned theoretical writers the first to discuss the *modus maximarum* was Prosdocimus de Baldemandis in his *Tractatus Practice de Musica* written in 1412 [6]. The inclusion of this matter in the *Notitia* suggests, so far as concerns its date, that the work was composed neither much before nor after the last part of the century.

* * *

The distinctive feature of the *Notitia* is its discussion (fols. 14v-18r), of the eight mensurations, where modal mensuration is based upon the *maxima*, and where the *modi longarum* are quite ignored. We may suppose that here our treatise aims at introducing the beginner to the Florentine practice in mensuration. It is in this discussion that we find the terminology peculiar to our treatise; for the signs and names employed in the definition of the eight modes are, so far as the present writer knows, to be found nowhere else [7]. Now, it is most improbable that a text for elementary instruction in the spoken tongue would resort to unusual terminology and manner of presentation, much less originate them. Therefore we are again driven to the unhappy conclusion that many sources of 14th century music have been lost. Such a treatise as ours would not have presented signs never used by composers. The only signs vaguely related to the ones in question are found in the Tuscan manuscripts, Florence, Laurenziana, 87 (Squarcialupi codex) and Paris, Bibl. nat., ital. 568 (for example, in the latter, fols. 131v, 132r).

The following are the signs and names used in our treatise for the eight mensurations, with the conventional names added:

[6] Published in Coussemaker, *Op. cit.*, III, and in C. Sartori's, *Op. cit.* Cf. the latter, p. 93, on the absence of any mention of the *modus maximarum* by others.

[7] These signs were reproduced by J. Wolf in his *Geschichte der Mensural-Notation*, p. 39. Wolf had not seen our Ms but had known it through some notes received from Fr. Ludwig. Cf. also 145 and 289 of Wolf's work. The reference by Wolf to fol. 14v of Redi 71 as the page on which the signs appear is wrong; they appear on fols. 15v on. The signs too as cited by Wolf are not all quite correct; nor are there any slight deviations of them later in the text as cited in his list (*loc. cit.*) and referred to fol. 21v, but only recurrences of the same signs.

1. *Modo perfecto suppremo* — or =

modus maior perfectus cum modus minor perfectus cum tempus perfectum cum prolatio maior.

2. *Modo perfecto lato* — or =

modus maior perfectus cum modus minor perfectus cum tempus imperfectum cum prolatio maior.

3. *Modo perfecto sublato* — or =

modus maior perfectus cum modus minor perfectus cum tempus perfectum cum prolatio minor

4. *Modo perfecto stremo* — =

modus maior perfectus cum modus minor perfectus cum tempus imperfectum cum prolatio minor.

5. *Modo imperfecto magiore* — =

modus maior imperfectus cum modus minor imperfectus cum tempus perfectum cum prolatio maior.

6. *Modo imperfecto minore* — =

modus maior imperfectus cum modus minor imperfectus cum tempus imperfectum cum prolatio maior.

7. *Modo imperfecto stremo* — =

modus maior imperfectus cum modus minor imperfectus cum tempus perfectum cum prolatio minor.

8. *Modo imperfecto substremo* — =

modus maior imperfectus cum modus minor imperfectus cum tempus imperfectum cum prolatio minor.

The discussion continues with the various prolations, but here we find no peculiar names or signs, whereas the above names for the 8 rhythmic modes must be considered original. Throughout the treatise the usual Latin terminology is used, translated into Italian, but a few times distinction is made between the name of the same thing according to the « tramontani » and according to the « italiani ». It would seem that the author of the *Notitia* was partial to the theory of the « tramontani », which of course

could only mean the French. In one case, discussing the perfecting of an imperfect note by a dot, *arte francesca* is mentioned (fol. 21r). There is no mention of any Italian theorist, except one reference to « li nostri autori musici passati » (fol. 14v), which may or may not mean the Italians; but we find a reference to Philippe de Vitry on the meaning of empty or red notes according to whether or not the black notes are perfect (fol. 18v). The passage by de Vitry in question is in his *Ars nova*[8]. Reference is also made to Johannes de Muris (as « Gian de Muris »), once in connection with the impossibility of syncopating the *semibrevis* rest in major prolation and the *brevis* rest in any prolation (fol. 23r), another time in reproducing (fol. 23v) two mensuration signs for perfect and imperfect modes. The references to J. de Muris have to do with *Libellus cantus mensurabilis* [9]. In fact this work seems to have had direct influence upon the second part of our treatise; but the first part, carrying the discussion of the 8 mensurations cited above seems to stand on its own ground.

Attention may be called to a few other terms peculiar to our treatise: *composita* for *ligatura cum opposita proprietate* (fol. 13r); *filo* for the stem of notes (also ligatures), i.e., for *cauda* (fols. 13r, 14v); *fusello* (translation from the French *fuisé* ?) for the *dragma*, worth two minima (fol. 20v); *Seperatione* (fol. 14r) and *spiratione* (fol. 24r) for *pausa*. Furthermore, by prolatione our author means both the mensuration of the *brevis* and the *semibrevis* and not only of the latter.

The theory of our treatise is defective, perhaps owing to its elementary scope. For example, there is no discussion of alteration except indirectly; instead of the usual four dots only two dots are discussed, and it is erroneously said (fol. 19v) that the *punctus divisionis* may cause the alteration of one of the two notes divided by it, when it has actually the opposite effect. As will be seen from the plan of our treatise given below, the organization of the material is not quite logical; and as to scribal errors, the work carries an abundance of them, especially in the musical examples where it is not always easy to see their point, and where sometimes an example shows the contrary of what it is supposed to illustrate. It is obvious that the scribe did not always understand the work he was copying.

The following is the plan of the work:

1. The musical signs
    a. the six notes
    b. perfect and imperfect notes
    c. rest
    d. ligatures

[8] See Coussemaker, *Op. cit.*, III, 21.
[9] Coussemaker, *Op. cit.*, III.

2. The rhythmic modes
   - The « modi perfecti »
   - a. modo perfecto suppremo
   - b. » » lato
   - c. » » sublato
   - d. » » stremo
   - The four « modi imperfecti »
   - e. modo imperfecto magiore
   - f. » » minore
   - g. » » stremo
   - h. » » substremo

3 The prolations
   - a. perfect prolation
   - b. imperfect prolation
   - c. perfect and imperfect notes
   - d. points
   - e. how prolations are divided

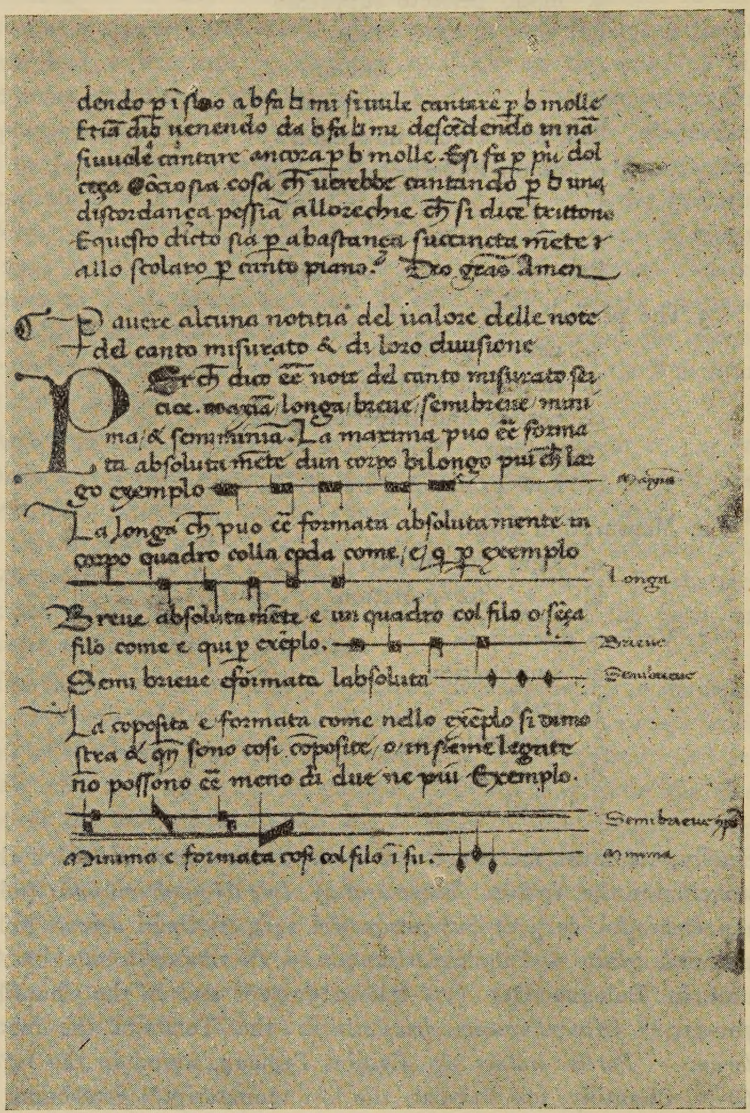
4. Mensuration signs
   - a. signs for *modus*
   - b. » for prolation

5. Various discussions
   - a. syncopation
   - b. rests
   - c. diminution
   - d. signs of *modus*
   - e. *colore* or *taglia*

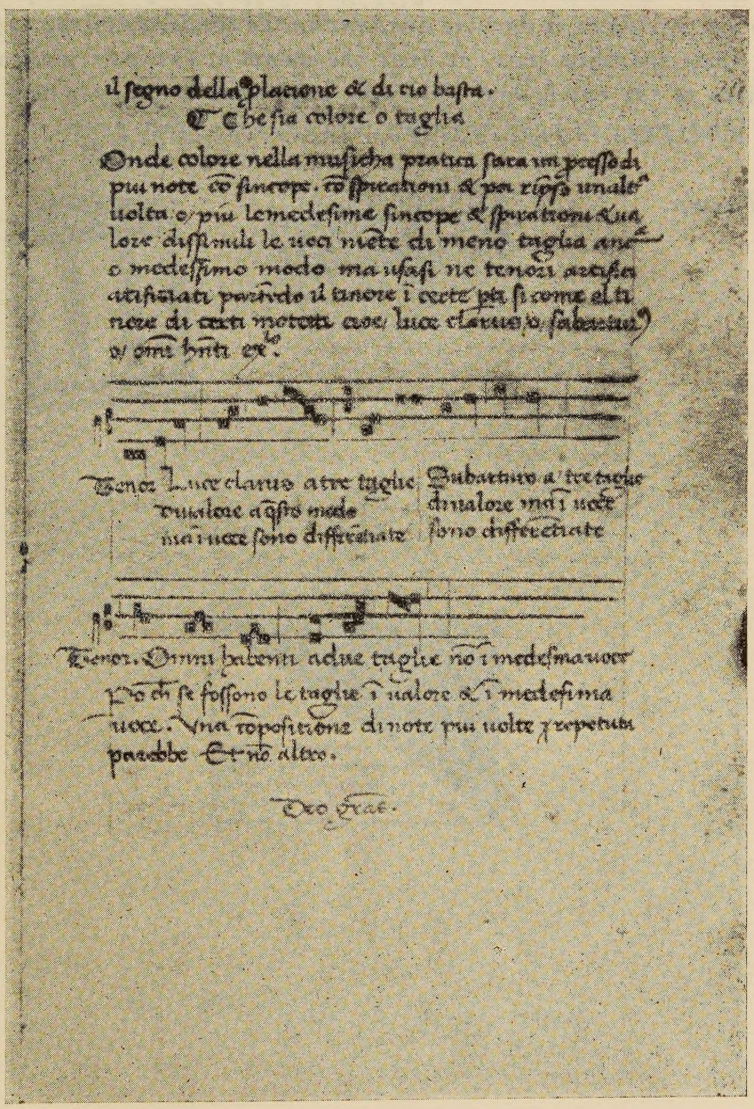
Finally, we must mention some isorhythmic tenors of which the first *talea* are cited in the *Notitia.* These are: a) *Ante thronum trinitatis* (fol. 23v), b) *Luce clarus* (fol. 24r), c) *Sub arturo* (fol 24r), d) *Omni habenti* (fol. 24r). Of these, *Sub arturo — Fons citharizantum — In omnum terram* by Allanus is found in Bologna Q15 (37) fols. 225v-226r and in the Chantilly Ms, fols. 70v-71r.[10] *Ante thronum trinitatis* is the Tenor of the motet *Ida Capillorum - Porcio nature* by Egidius Pusieux, found in the Ivrea Ms, fols. 6v-7r, Chantilly, fols 61v-62r, the lost manuscript[11] Strasbourg M.222 C.22, and elsewhere. *Luce clarus* ad *Omni habenti* may be the names of

[10] Cf. J. Wolf, *Schrifttafeln,* 30-31.

[11] Charles Van den Borren, *Le Manuscrit musical M. 222 C. 22 de la Bibliothèque de Strasbourg (XV^e siècle) brulé en* 1870, *et reconstitué d'après une copie partielle d'Edmond de Coussemaker,* Antwerp, 1924; Heinrich Besseler, « Studien zur Musik des Mittelalters » in *AfM,* VII and VIII.


dendo p i ſuo a bſa b mi ſimile cantare p b molle
trīa dīb uenendo da bſa b mi deſcēdendo in nā
ſimile cāntare ancora p b molle. Eſi ſa p più dol
ceza ēcco ſia coſa ch uerebbe cantando p b una
diſtordança peſſia allorechie ch ſi dice trittono
Equeſto dicto ſia p abaſtança ſuccincta mēte r
allo ſcolaro p canto piano. Deo gras Amen
Per auere alcuna notitia del ualore delle note
del canto miſurato & di loro duuiſione
Perch duo ēe note del canto miſurato ſi
cae. maxīa longa breue ſemibreue minī
ma & ſemīminia. La maxima puo ēe forma
ta abſolutamēte dun corpo bilongo più ch lar
go exemplo
Maxima
La longa ch puo ēe formata abſolutamente in
corpo quadro colla coda come q p exemplo
Longa
Breue abſoluta mēte e un quadro col filo o ſēza
filo come e qui p exēplo.
Breue
Semibreue
Semi breue eformata labſoluta
La coposita e formata come nello exēplo ſi dimo
ſtra & qn ſono coſi coposite o inſieme legate
no poſſono ēe meno di due ne più Exemplo.
Semibreue cōp
Minima e formata coſi col filo i ſu.
Minima

Bibl. Mediceo-Laurenziana, Ms Redi 71.
The beginning of the *Notitia*.


il segno della plicatione & di cio basta.
Che sia colore o taglia
Onde colore nella musicha pratica sara im presso di
pu note co sincope. co spreationi & poi rispo una
uolta o piu le medesime sincope & spreationi cha
lore dissimili le uoci niete di meno taglia an
o medesimo modo ma usasi ne tenori artifici
artificiati pavido il tenore i certe pti si come el te
nere di certi motetti cioe Luce clarius o sabatum
& omni hnti ex.
Tenor Luce clarus a tre taglie
tu alore a qsto modo
ma i uoci sono differeniate
Subbatum a tre taglie
di valore ma i uoci
sono differeniate
Tenor. Omni habenti adue taglie no i medesma uoce
pro di se fossono le taglie i valore & i medesima
uoce. Una topositione di note piu uolte repetuta
parebbe Et no altro.
Deo gras.

Bibl. Mediceo-Laurenziana, Ms Redi 71.
The end of the *Notitia*.

motets or of their tenors, at all events unknown to the present writer. It is interesting to note in connection with the date of the *Notitia* that the two tenors identified here belong to the last of the 14th century. As to the other two pieces, if they are unknown to the specialists of the 14th century, these specialists have at least the names of two new musical compositions of the epoch, and they may hope that someday a new source may bring them to light, together, perhaps, with other pieces.

Florence.